ROADS and STREETS

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HIGHWAYS • BRIDGES • AIR FIELDS • HEAVY CONSTRUCTION

A GILLETTE PUBLICATION

Gillette Publishing Co., 22 West Maple St., Chicago 10, Illinois • Accepted as Controlled Circulation Publication at Milwaukee, Wis.

New high-speed hoist bodies shortened paver cycle. (See page 22 in this issue)

Practical Ideas for Expediting Contractor Work

Detailed Design of a Prestressed Concrete Bridge

May 1957

mighty mobile muscles...

CHRYSLER INDUSTRIAL 32
(265 cu. in. displacement) powers the Crane Carrier Corp. carrier. Chrysler Industrial 30 (230 cu. in. displacement) powers the P & H Miti-Mite. Both are in-line 6 Engines used on many makes of equipment in the construction and materials handling field. There are four Chrysler in-line 6s, two V-8s—ranging from 230 to 354 cu. inch displacement.

Hard-hitting, fast-moving Chrysler-powered combination specially designed for a wide variety of "in-between" digging and lifting jobs. *P & H Miti-Mite* converts on the job to crane, shovel, dragline, trench hoe, clamshell, magnet crane. All transmission parts are encased in oil—work on anti-friction bearings. *Crane Carrier Corp.* carrier has rugged H-beam frame with all-welded construction. Both the *Miti-Mite* and the *Carrier* are powered by Chrysler for peak operating efficiency and minimum maintenance.

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INDUSTRIAL ENGINE DIVISION • CHRYSLER CORPORATION

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☐ For specific detailed information ☐ For descriptive literature

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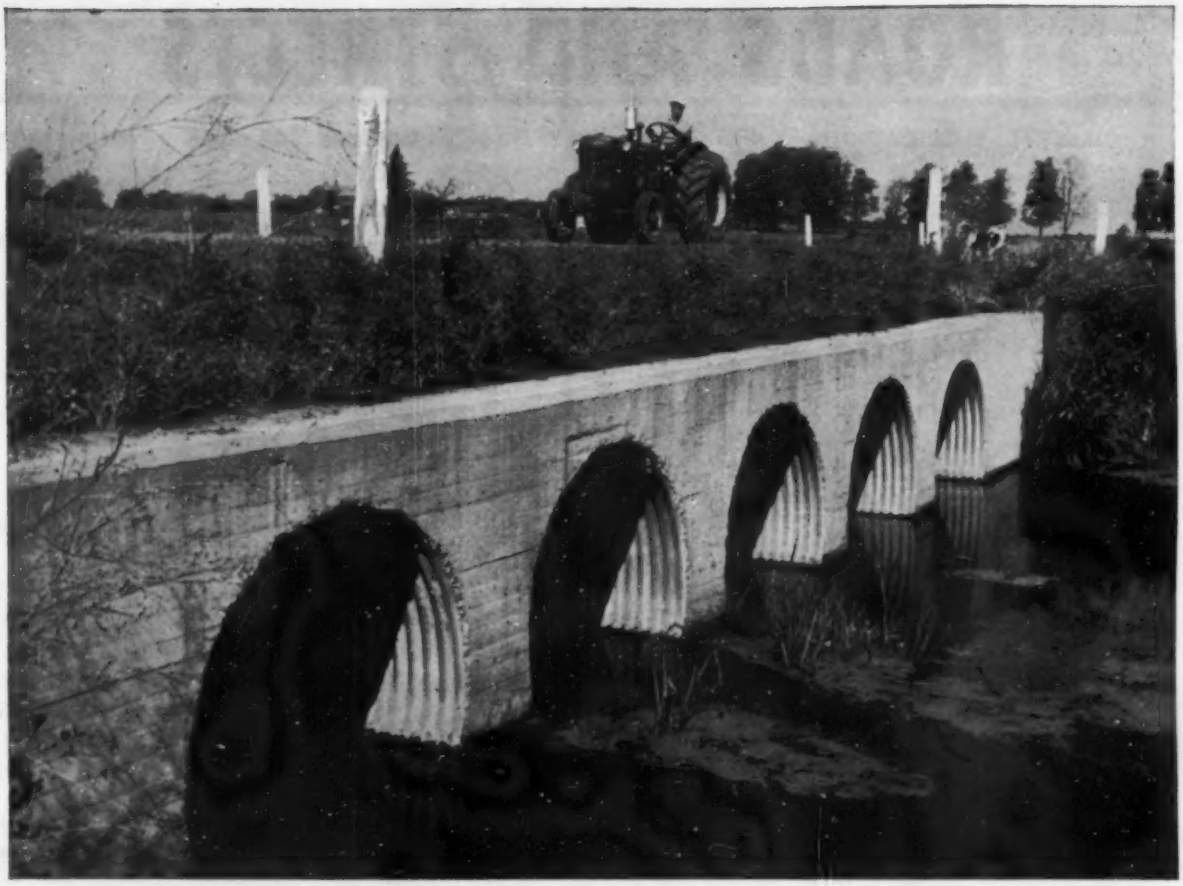

Pipe made from Beth-Cu-Loy offers economical ways to cross water

Building a road across a stream can be a challenge to the engineer with limited funds to work with. Yet the problem can be handled to produce a result that is functional, attractive and economical all at once! These photographs offer convincing proof.

Both of these installations took advantage of the superior qualities of pipe made from Beth-Cu-Loy galvanized steel culvert sheets. By "superior qualities," we refer, for example, to light weight which makes handling, shipping and installing easier and less costly. And we include the great strength which only steel possesses.

Then there is the flexibility of steel pipe, which permits conformation to grade and alignment, as well as the absorption of impact, vibration and freezing actions. And there's corrosion-resistance, for Beth-Cu-Loy is copper-bearing steel with the added protection of a heavy coating of rust-defying zinc.

Beth-Cu-Loy culvert sheets conform to the rigid specifications of the American Association of State Highway Officials. If you want additional details about Beth-Cu-Loy, or the names of some of the fabricators who use it in making drainage pipe, just get in touch with the nearest Bethlehem sales office or write direct to our general offices.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

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ROADS AND STREETS

A GILLETTE PUBLICATION • MAY, 1957 • VOLUME 100 • NUMBER 5

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EARTHMOVING:

A new cycle of articles, describing earthmoving and rock excavation jobs which are expedited by the latest equipment and management techniques . . . Another report on the California "Big Cut" project soon.

ADMINISTRATIVE:

How to sell citizens on Interstate highway relocation and access control policies. In Virginia the Chamber of Commerce has helped stage advance meetings—so that when hearings are held, local citizens see the whole picture and cooperate.

BRIDGES:

Contractors as well as engineers will want to read the nation-wide review of trends in highway bridge design and construction, see next issue . . . Also coming: Illinois state-wide program to widen old narrow bridges.

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ON 9-MILE STRETCH OF MASSACHUSETTS TURNPIKE!

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THOROUGH MAINTENANCE A SECRET OF SUCCESS—This earth-moving monster has been overturned to simplify underside repairs. Tires are All-Weather Earthmover. Like all Goodyear tires, these are readily recappable—just contact your Goodyear dealer.

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with Goodyear 3-T Nylon Cord

TUBELESS TIRES!

Ever consider what tube and flap troubles can cost in down time—plus cost of *replacing* tubes, long before tires are worn out?

And Goodyear TUBELESS tires save in many other ways! They run cooler—injuries are easy to detect—blowouts rarely occur—many repairs are simpler than ever before—construction and assembly are *airtight*—mounting of all sizes is quick and sure—and the simpler valve parts are re-usable!

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Goodyear, Truck Tire Dept., Akron 16, Ohio

NOW IN 3-T NYLON CORD —*TUBELESS* OR TUBE-TYPE!

Look for this nearby Goodyear dealer sign for better tire values—better tire care.

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MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

Road Lug, All-Weather, Sure-Grip—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

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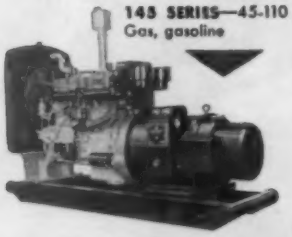

A superb line of Enginators— backed by over 50 years' experience in building heavy-duty engines and electrical equipment. For reliable performance on all fuels, these accurately balanced Waukesha engine-generator combination units supply smooth, steady power in continuous, intermittent and standby service.

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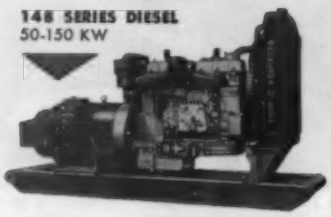

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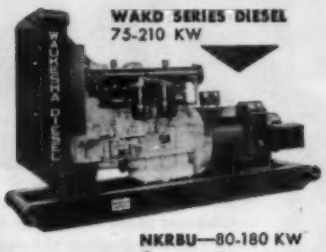

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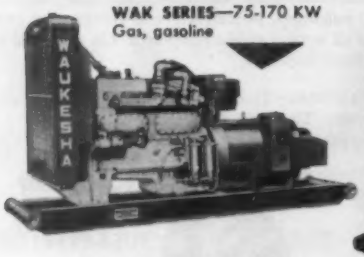

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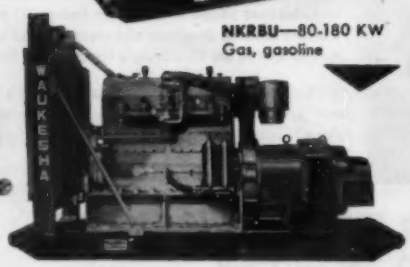

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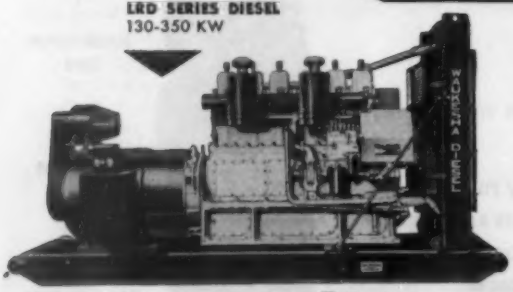

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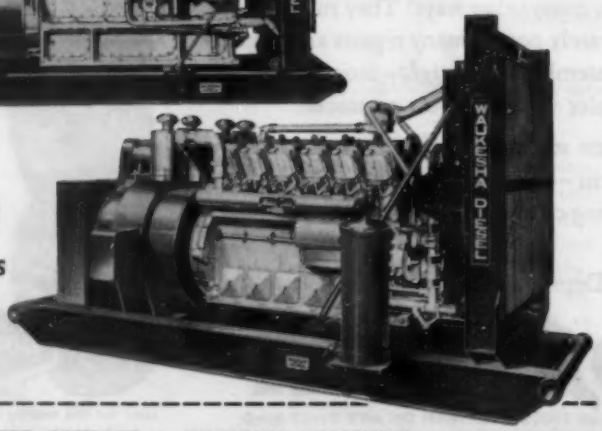

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WAUKESHA MOTOR COMPANY • WAUKESHA, WISCONSIN *RAILWAY DIVISION*

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ROADS AND STREETS

Devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations; the construction and maintenance of airports. Represents 65 years of continuous publishing in the highway field; combined with Engineering and Contracting and Good Roads Magazines, established in 1892.

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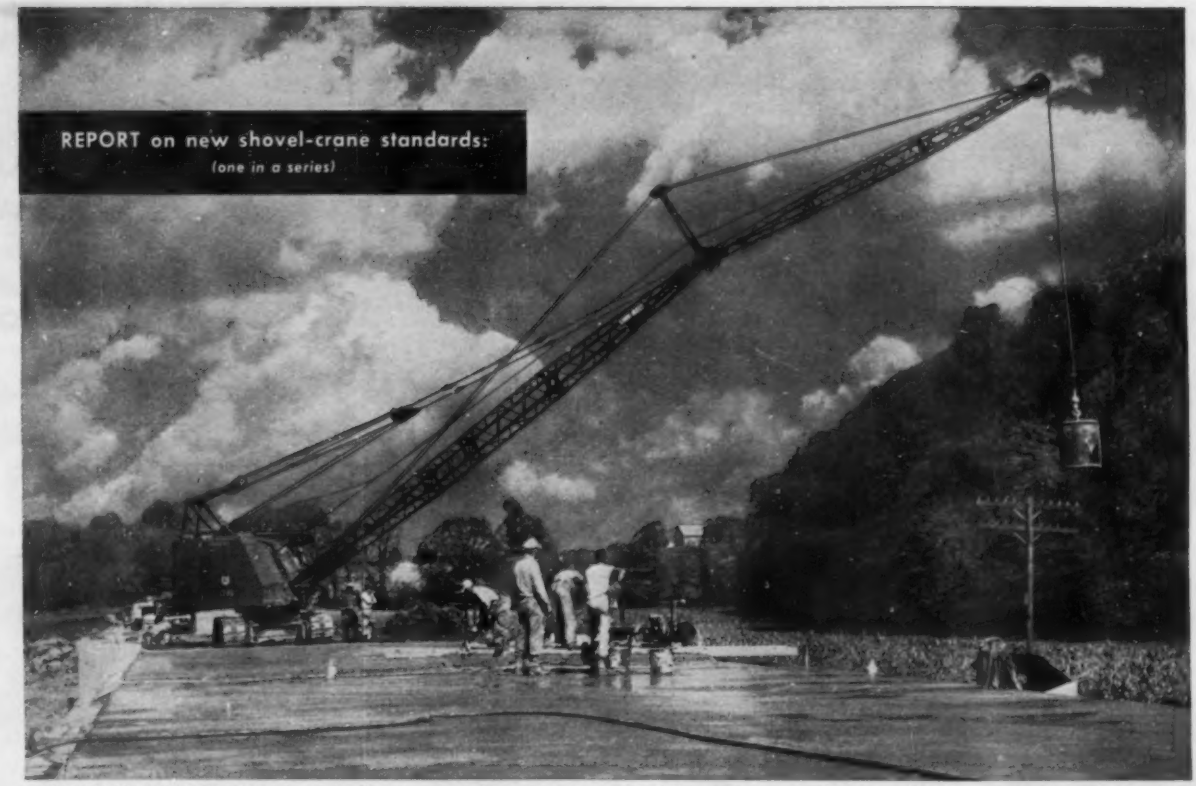


NEW FEATURES—Link-Belt Speeder shovel-cranes offer many important production-increasing advantages including reversing clutches for either or both main drums, a third drum and independent rapid boom hoist for power-raising and power-controlled lowering.

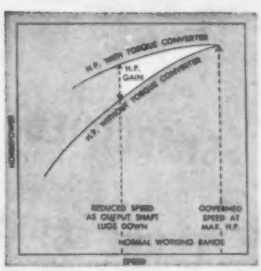
Getting bonus power...extra line pull

Size for size, Link-Belt Speeder shovel-cranes deliver greater usable horsepower than other machines using the same engines

Engine size alone is not a correct measure of a shovel-crane's actual *usable* horsepower. Thus, it's important to know Link-Belt Speeders deliver more *usable* horsepower or line pull at the drums than other machines using the same engine, yet remain well within engine manufacturers' recommended operating speeds.

Why? A Link-Belt Speeder is designed and built with extra size and strength in shafts, gears, clutches and structural members. It has the strength to fully utilize available engine power.

It's another reason why Link-Belt Speeder shovel-cranes are setting entirely new high standards of efficiency. For complete facts, contact your Link-Belt Speeder distributor or write—Link-Belt Speeder Corporation, Cedar Rapids, Iowa. 14,075-B



TORQUE CONVERTERS are available for all Link-Belt Speeder models, supply power to match the load . . . provide sustained power, increased line pull to maintain high production even with heavy loads and to handle these big loads smoothly, accurately!

POWER HYDRAULIC CONTROLS are operated with the flick of a finger, provide fast, positive response . . . perfect feel of the load for added safety. They're standard equipment on all crawler and rubber-tired models ½ to 3-yd, 8 to 75-ton capacities.

It's time to compare . . . with

LINK-BELT SPEEDER

Builders of a complete line of shovel-cranes . . . with exclusive Speed-o-Matic power hydraulic controls

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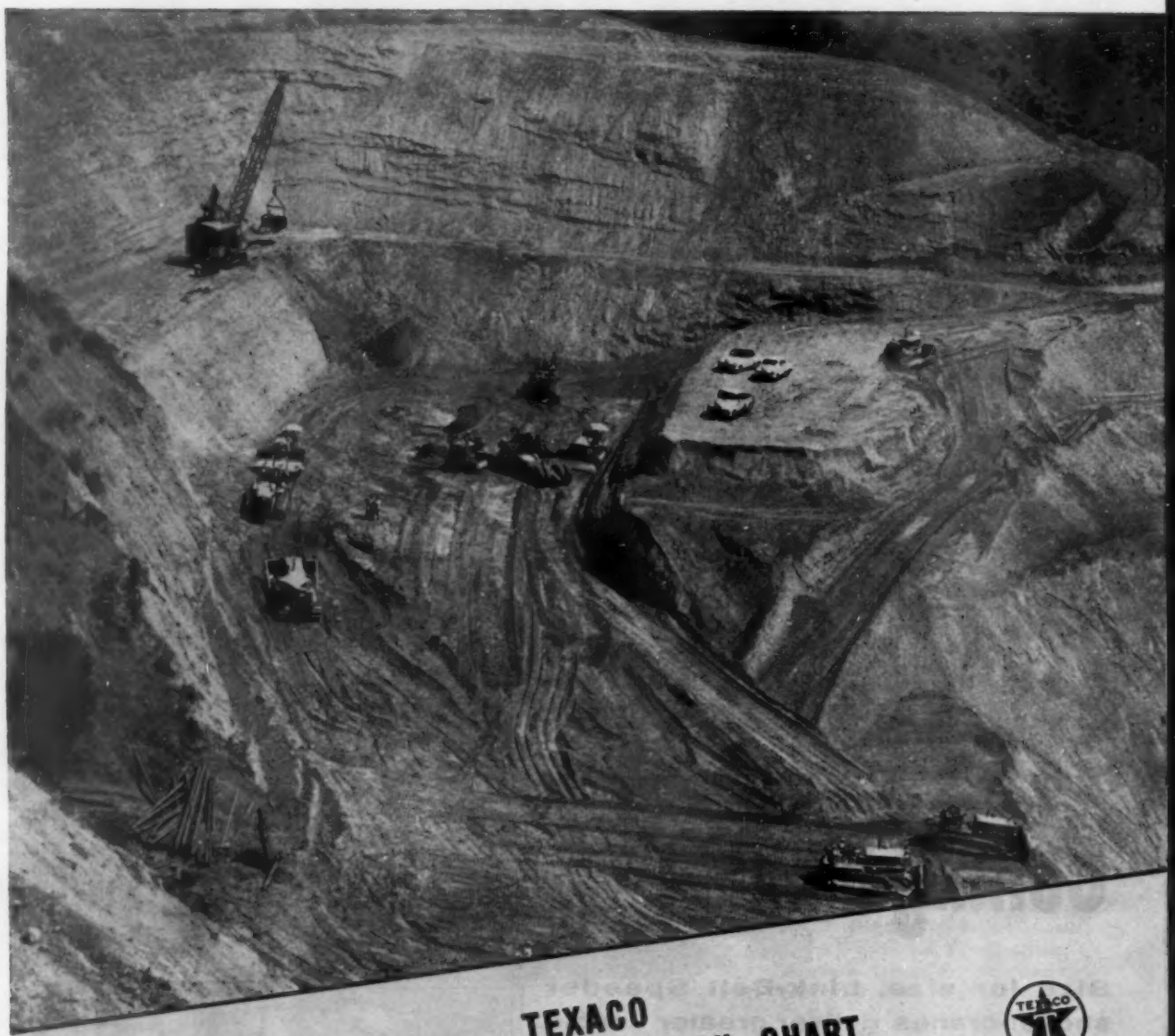


TEXACO
SIMPLIFIED LUBRICATION CHART
for
LARGE CONSTRUCTION PROJECTS

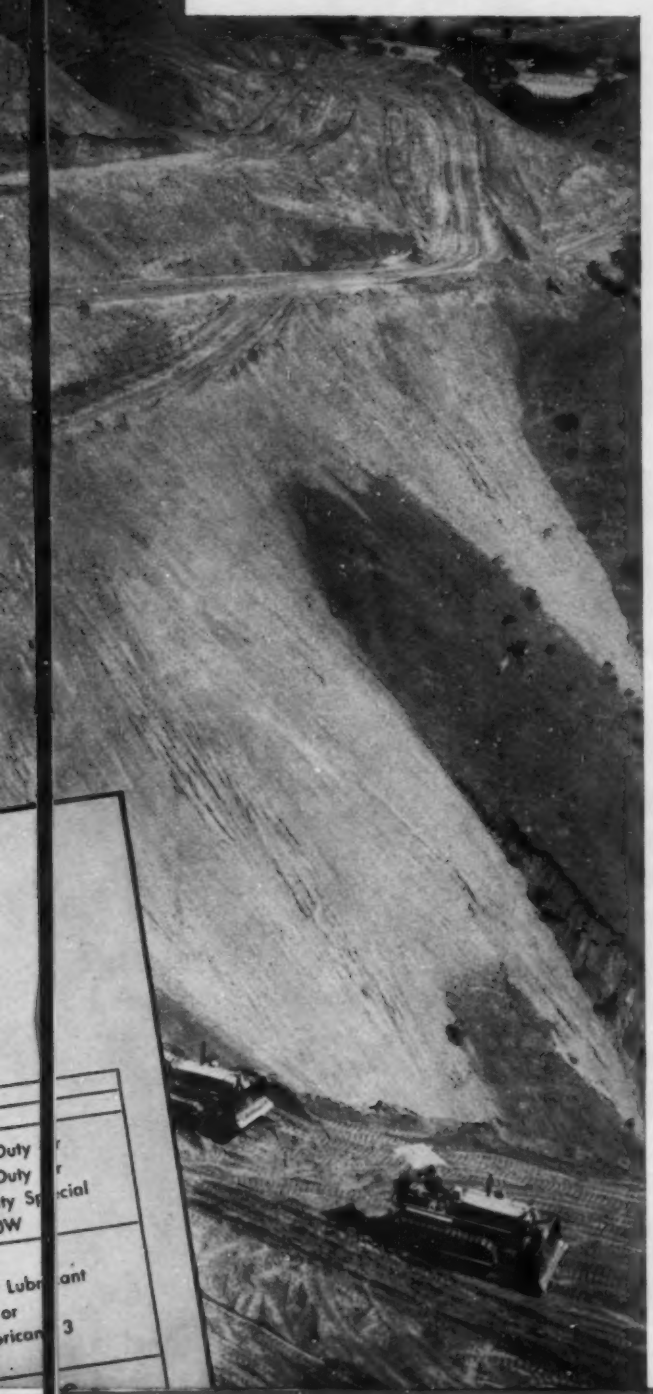
PART REQUIRING LUBRICATION	INTERVAL HOURS	TEXACO PODUCTS	
		90–32° F	32–10° F
Engines (Gasoline, LPG and Diesel)	100	Ursa Oil Heavy Duty or	Ursa Oil Heavy Duty
Engine Accessories—Oil Lubricated	100	Ursa Oil Super Duty or	Ursa Oil Super Duty
Bearings—Oil Lubricated	As required	Ursa Oil Super Duty Special SAE 30	Ursa Oil Super Duty Sp SAE 20-20W
	1000	Universal Gear Lubricant	Universal Gear Lubr
	100	EP 140 or	EP 90 or
		...bricant 6	Merapo Lubricant

TEXACO

It's easy to keep the job on schedule

with your own

TEXACO SIMPLIFIED LUBRICATION PLAN



All your major lubrication can be done with just 6 lubricants — and no more — when you follow a Texaco Simplified Lubrication Plan. Tailored by Texaco to fit any job you do, every Texaco Simplified Lubrication Plan takes all the guesswork out of lubrication. It makes it possible to avoid lubrication errors that all too often send equipment to the repair shop. And because fewer lubricants are necessary, lubricant inventory is reduced and greater simplicity — and economy — are assured.

Your chart will certainly specify a *Texaco Ursa Oil* to keep your diesels and heavy duty gasoline engines on the toughest jobs — without breakdowns. The *Texaco Ursa Oils* recommended for contractors' equipment are both detergent and dispersive—rings stay free, valves seat properly and you get full compression and complete combustion. You get, in effect, what you need most from your equipment — dependable performance to meet tight schedules.

ASK A TEXACO LUBRICATION ENGINEER

to simplify your lubrication and reduce costs with a Texaco Simplified Lubrication Plan. Just call any of the more than 2,000 Texaco Distributing Plants in the 48 States or write:

The Texas Company, 135 East 42nd Street, New York 17, N.Y.

Lubricants and Fuels

FOR ALL CONTRACTORS' EQUIPMENT

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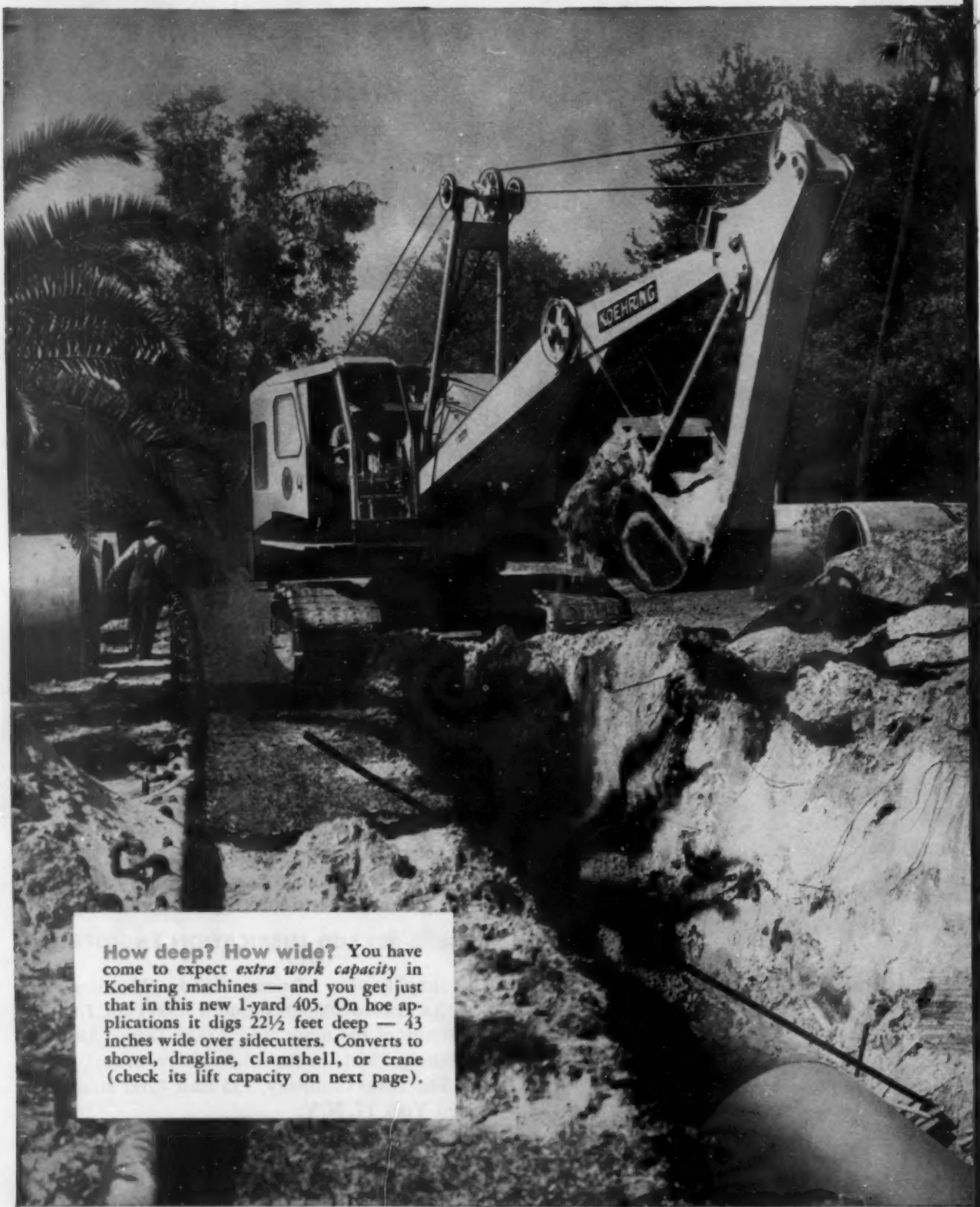
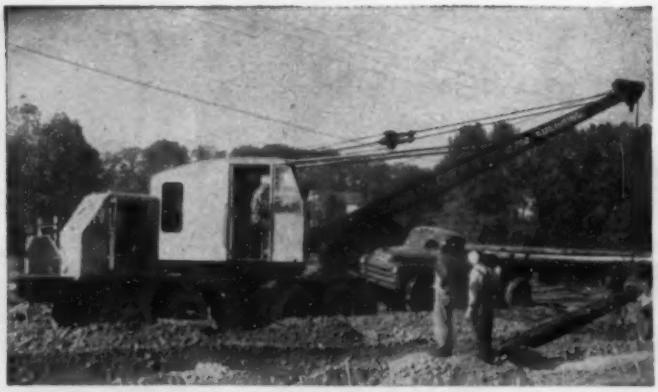
KOEHRING WORK CAPACITY *in action . . .*



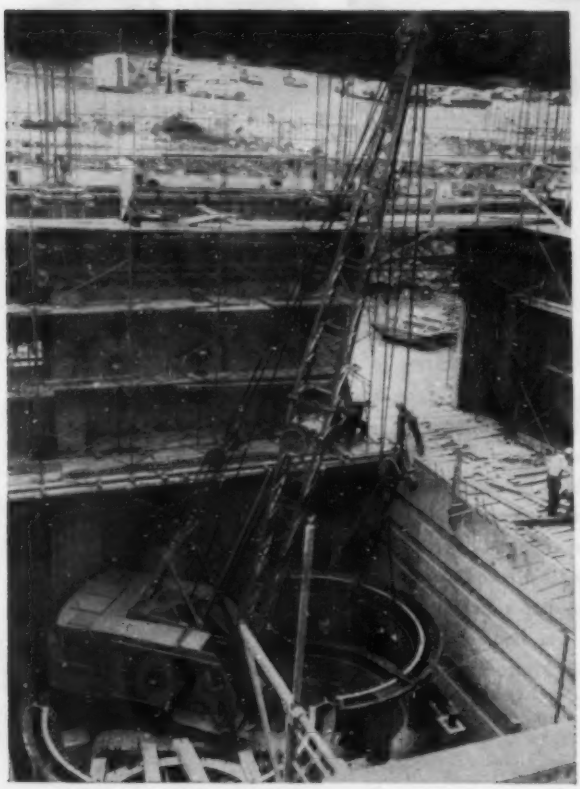
How deep? How wide? You have come to expect *extra work capacity* in Koehring machines — and you get just that in this new 1-yard 405. On hoe applications it digs 22½ feet deep — 43 inches wide over sidecutters. Converts to shovel, dragline, clamshell, or crane (check its lift capacity on next page).

KOEHRING COMPANY Milwaukee 16, Wis. Subsidiaries: JOHNSON • PARSONS • KWIK-MIX

Pipeline yields right-of-way — To lower street grade for a turnpike underpass, it was necessary to relocate this high-pressure gas line. Long sections of 8-inch steel pipe were easily lifted out of the ditch and loaded onto trucks by a Koehring 15-ton truck crane. It's equipped with a special clamp for grabbing the pipe. Travel is unrestricted on this mobile 205 truck crane. Overall width is 8 feet. Axle load distribution conforms to highway regulations in most areas — even when carrying 25 feet of crane boom over the steering end.



Flood waters backed up from a swollen river, filling this uncompleted drainage ditch — but that didn't stop the work. Contractor specializes on farmland drainage with this 305 dragline. It is a recent addition to the Koehring heavy-duty line — has all the standard attachments (more details listed below).



Down in the hole — On construction of a new powerhouse, Koehring 36-ton crane was run in through an opening in basement wall to install machinery. Here, it sets a speed-ring in place. For high lifts, up to 110 feet of straight boom can be used on this 605 crane — or, for extra reach — 100-foot boom with max. 30-foot jib.

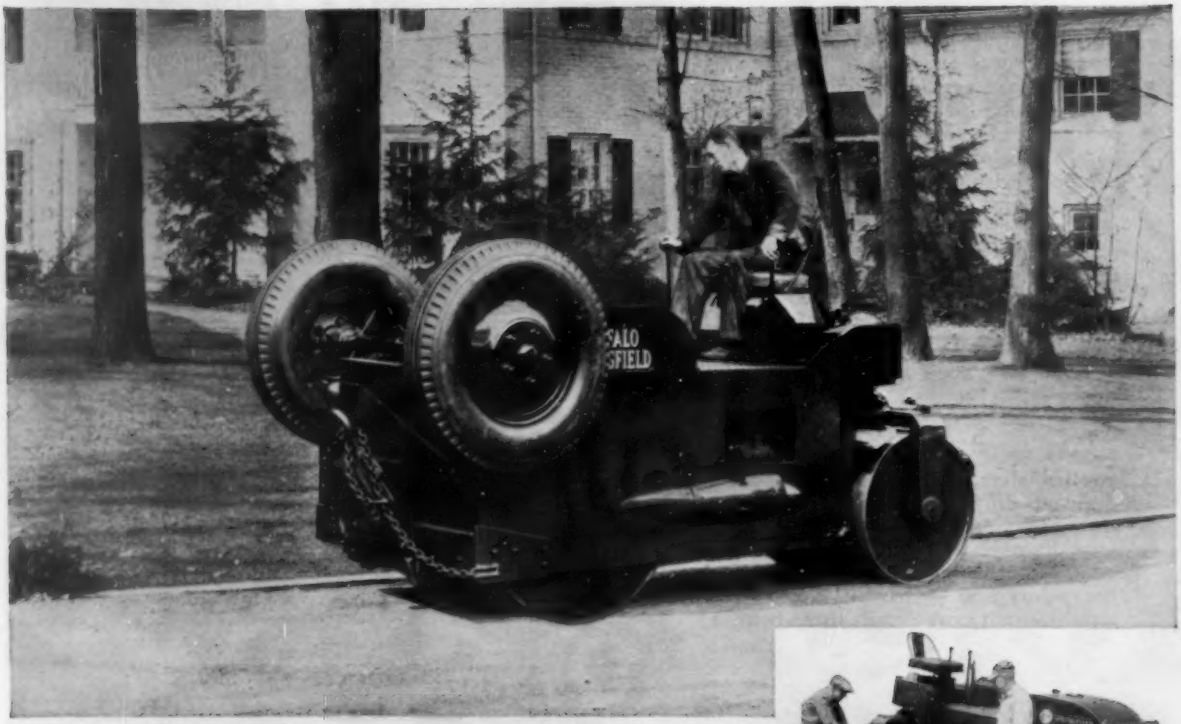
Here are some figures that will interest you:

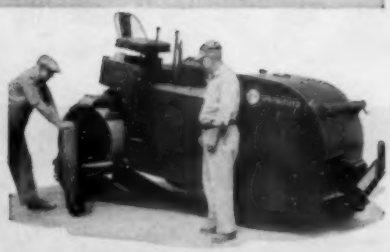
KOEHRING MODEL	SIZE DIPPER	LIFT CAPACITIES (Crawler ratings based on 75% of tipping load. Rubber-tired machines — 85% of tipping load.)	
205 CRAWLER	½-Yd.	20,000 lbs.	at 10-foot radius
205 ON RUBBER	½-Yd.	30,000 lbs. 13,700 lbs.	at 12-foot radius at 20-foot radius
305 CRAWLER	¾-Yd.	30,000 lbs.	at 12-foot radius
305 ON RUBBER	¾-Yd.	50,000 lbs. 15,800 lbs.	at 10-foot radius at 30-foot radius
405 CRAWLER	1-Yd.	40,000 lbs.	at 12-foot radius
605 CRAWLER	1½-Yds.	72,300 lbs.	at 12-foot radius
1205 CRAWLER	3-Yds.	190,000 lbs.	at 13-foot radius

KOEHRING HEAVY DUTY

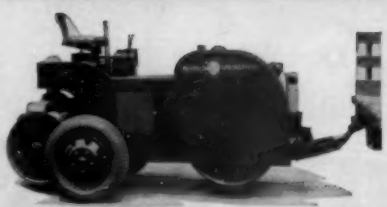
Want more information? Call Koehring distributor today.

. . . for more details circle 294, page 16





The Roller is easily rigged for towing. Inclined wooden blocks are provided for raising guide roll to slip on road wheels and pin them in place.



Towing hitch is quickly engaged with pintle on towing vehicle. Hand-operated hydraulic jack installed as part of the towing attachment is employed to raise the drive roll off ground.

For heavy-duty rolling *PLUS PORTABILITY...use this* BUFFALO-SPRINGFIELD Roller

A conventional heavy-duty roller in construction and performance, this 3-5 ton Tandem Roller, when equipped with the Towing Attachment*, is easily transported from job to job. All essential design features of the larger Buffalo-Springfield tandems, *plus portability*, make this particular roller especially popular for handling a large variety of smaller rolling jobs.

Driveways, sidewalks, parking and playground areas, patching and light finishing work are finished fast . . . and the Portable roller is ready for new work at a different location, with minimum time lost.

Rubber tired road wheels are carried out of the way, on a bracket over the drive roll. When the roller is working, there are no tire treads to mar surface materials or produce uneven surface compaction. For heavy-duty roller performance, plus the economy of using *one* roller quickly at scattered locations, get a Buffalo-Springfield *Portable* Tandem Roller.

See your Buffalo-Springfield distributor now, or write for Bulletin S-58-49 for complete details.

*Towing Attachment is available as optional equipment.

BUFFALO-SPRINGFIELD ROLLER CO.
DIVISION OF KOEHRING COMPANY · SPRINGFIELD, OHIO

. . . for more details circle 252, page 16

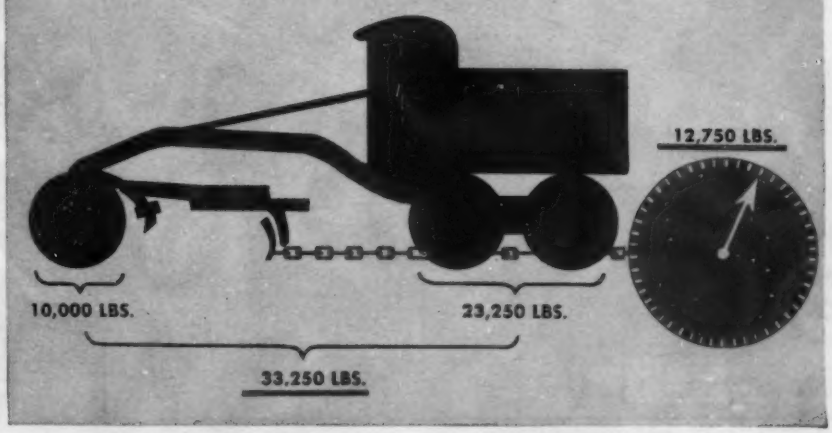
Not "How Big?" But "How Good?"

The ability of any motor grader to do hard cutting, and move big blade loads of material in the lower gears, where heavy work is done, depends entirely upon the amount of weight carried on *driving wheels*. Total weight has nothing to do with it.

Most for Your Money
From every standpoint . . . first cost, operating cost and upkeep . . . the A-W Power Grader gives you more for your money . . . moves 30 percent more material than an ordinary grader of equal weight and horsepower; and as much material as heavier, more expensive graders . . . as explained in the diagrams at the right.

ABOVE: This Austin-Western Power Grader weighs 23,250 lbs.—all carried on driving wheels. Working in average dirt, it has a blade pull of 12,750 lbs.

BELOW: To obtain the same blade pull, an ordinary motor grader would have to carry 23,250 lbs. on its *rear drivers*; PLUS about 10,000 lbs. on its *dead front end*, for a total of 33,250 lbs.



SIZE IS NOT THE MEASURE OF MOTOR GRADER PERFORMANCE

There's more to the story. All-Wheel Steer makes the machine twice as maneuverable as graders with front steer only; while the Controlled Traction made possible by the teamwork of All-Wheel Drive and All-Wheel Steer moves more material . . . moves it farther . . . moves it faster. Your nearby Austin-Western distributor will be glad to tell you the whole story of "The Power Graders That Have Everything."

Power Graders • Motor Sweepers • Road Rollers • Hydraulic Cranes

BALDWIN BLH LIMA-HAMILTON

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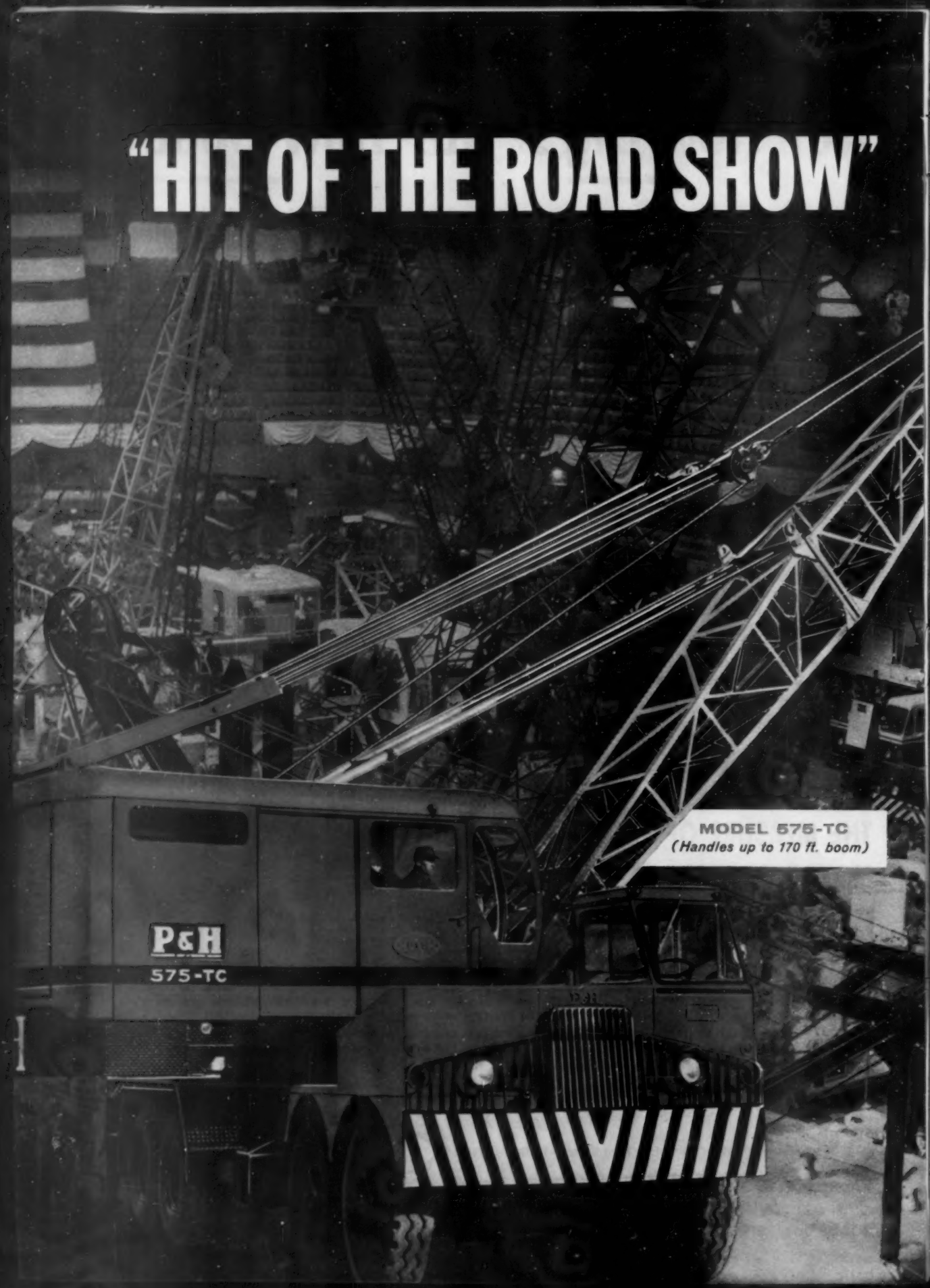
AURORA, ILLINOIS, U.S.A.

. . . for more details circle 244, page 16


"HIT OF THE ROAD SHOW"
MODEL 575-TC
(Handles up to 170 ft. boom)
P&H
575-TC

P&H 45 TON TRUCK CRANE

more machine — means more profitable operation

Lifts 45 tons at 15 foot radius, 8 wheels, 4 wheel drive, 12 tires. We were told by many visitors that for them the outstanding attraction at the Road Show was the P&H 575-TC—part of the continuing program of P&H product development creating new standards for truck crane capacity and mobility.

With the P&H 575-TC you get 45 tons of *genuine* lifting capacity at a practical 15 foot radius with lots of reserve power. Substantial money savings result when you use this versatile P&H truck crane on jobs that formerly were double-lifted by two smaller rigs—or handled by less mobile crawler cranes.

This 8 x 4 (4 axle) Model 575-TC is the strongest 45 ton carrier built. Wide speed selections and direct, positive, commercial truck-type controls assure easy travel and maneuverability. It has the same turning radius as 3 axle rigs.

P&H provides a single source of responsibility for the upper and the carrier. Both are P&H designed and built expressly for 45 ton needs.

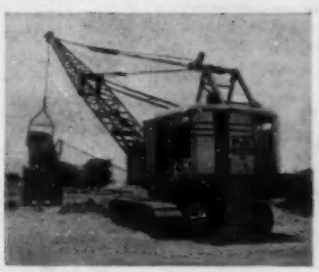
Other P&H features—independent planetary boom lowering—triple safe boom hoist—direct hydraulic controls—live roller circle—lighter yet stronger alloy steel lattice boom are standard equipment on the Model 575-TC.

See your dealer. He will demonstrate these and other profit producing P&H features.

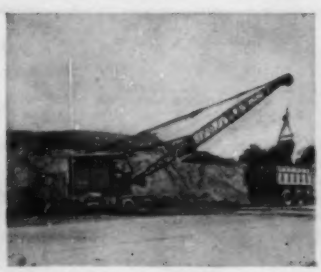
Harnischfeger Corporation
Construction & Mining Division
Milwaukee 46, Wisconsin

THE P&H LINE Truck Cranes: 8, 10, 15, 20, 25, 30, 35 and 45 tons
Shovels: ⅛, ¾, 1½, 1¾, 2½, and 3½ yards

Across the country P&H machines lead the field in power, speed, flexibility, and profitable performance



TEXAS
For handling loads up to 50 tons profitably there is the P&H 855B-LC. Here is Houston Lighting & Power Company's P&H 855B-LC crane with extra long crawlers shown at work with 2½ yds. dragline—their 4th P&H machine.



NEW YORK
In the 20 ton class, E. G. DeLia & Sons, New Hartford, New York depend on their P&H 255A-TC with 1 yd. clam-shell bucket to hold down cost in pipe laying and backfill work on new road near Gloversville, New York.

WISCONSIN
M.A.C. Construction Co., Kenosha, Wisconsin profits from the lively swings and dependable performance of their ½ yard P&H 155A trench hoe. It is shown at work on water pipe project for the city of Burlington, Wisconsin.

. . . for more details circle 280, page 16

Write today for Bulletin TX-186 on the P&H 575-TC fully convertible 45 ton Truck Crane

Harnischfeger Corporation, Dept. 513-B
Construction & Mining Division
Milwaukee 46, Wisconsin

Gentlemen:
Please send me Bulletin TX-186 on the 45 ton P&H 575-TC

Name _____

Title _____

Firm _____

Street _____

City _____ *Zone* _____ *State* _____

WHAT'S NEW in Equipment and Materials

5,000 Watt Electric Plant

A new lightweight, portable 5,000 watt direct current electric generating plant is currently being made available by D. W. Onan & Sons Inc, Minneapolis, Minn.

This self-contained generating plant provides full capacity direct current electric power to operate lights, electric tools and universal motors for contractors, and for manufacturers whose equipment necessitates the use of DC power.

Prime mover for the plant is the Onan 2-cyl. opposed, 4-cycle, air-cooled, gasoline engine, model CCK, rated at 12.9 hp. The generator is direct-connected to the engine for positive, permanent alignment. Of drip-proof design, it is rated at 5,000 watts, 115 volts DC. Total weight of the entire unit is 315 lb.

For more information circle 101 on Service Coupon this page and mail now.

Electric Elevating Tailgate

The "Jiffy-Lift" electric powered tail gate, a product of Midwest Body & Manufacturing, Paris, Ill., is stated to lift up to 600 lb. in fifteen seconds by simply touching a button. Companion to Mid-West's manually operated model, this new gate is geared to eliminate battery drag. The motor is reversible, has built-in brake and a special lock for safety. The all steel, ramp-type unit weighs 225 lb. and is designed to save rear and over balance and provide better weight distribution with larger load capacity.

For more information circle 102 on Service Coupon this page and mail now.

Elastic Anti-Rust Paint

A new special grade of its CI-88 anti-rust paint is announced by Chem Industrial Co., Brooklyn 9, Ohio. Known as "88 Special," it combines a "heavy" bituminous alkyd base with a special penetrating vehicle. The latter is reputed to cut through moisture to surface metal. It is recommended by the manufacturer for wet weather applications or use where it is impossible to dry a metal surface properly. "88 Special" forms a shiny black elastic coating that resists mild industrial acids and fumes, grease, oil and extreme temperature changes. It is said to retard the corrosive effects of salt water and salt-laden air.

For more information circle 103 on Service Coupon this page and mail now.

4200 GPH Diaphragm Pump

The Ralph B. Carter Co., Hackensack, N.J., announces a new addition to its line of Humdinger pumps—a full capacity, 3-in. unit weighing 125 lb., rated at 4200 gph, but reported on maximum stroke tests to have handled over twice this capacity. Designation is model 3ADF.

The pump body and housing are cast of high strength aluminum alloy. Engine power is transmitted to the totally enclosed drive through a shock absorbing flexible coupling.

The full swing check valves are made of durable neoprene compound, designed with oversize weights to insure positive seating on every stroke. Fittings are available in 2-in. and 3-in. IPS suction and discharge. Choice of power includes gasoline engine or electric motor drive.

For more information circle 104 on Service Coupon this page and mail now.

More Equipment News Pages 40, 150

25-KVAR Electrical Capacitor

A new 25-kvar capacitor, has been developed by General Electric Co., Schenectady, N.Y.

Weight reductions amount to more than 25 per cent on single units, and over 225 lb. on 300-kvar pole-top equipment. Over-all dimensions have been reduced. The case is approximately 2 in. shorter, while the depth has been reduced from 5 to 4 in.

Despite changes, the new capacitor can be substituted in all equipment designed for the larger 25-kvar units. It complies fully with NEMA standards.

The new design will mean less weight on crossarms and poles, and will make possible the placing of a greater number of capacitors on some poles and provide greater ease in handling and storage, according to the company.

For more information circle 105 on Service Coupon this page and mail now.

6, 5, 4-Ton Capacity Jibs

Link-Belt Speeder Corp., Cedar Rapids, Iowa, has just announced three new high-capacity jibs 20, 30 and 40 ft. in length, with 6, 5 and 4-ton capacities (double the capacities of the company's previous jibs). These jibs are for use on Link Belt's 88, 98 and 108 series crawler and rubber-tired shovel-cranes. They are fabricated from a high-strength alloy steel said to be considerably lighter than standard structural steel generally used for jibs, while equalling or exceeding the structural steel in strength.

For more information circle 106 on Service Coupon this page and mail now.

MAIL THIS COUPON TODAY!

ROADS & STREETS
22 West Maple Street
Chicago 10, Illinois

CIRCLE THE NUMBERS AND MAIL NOW!

Please send me further information on products and materials mentioned in the May Roads & Streets as circled below

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NOT GOOD AFTER JUNE 15, 1957

A READER SERVICE FOR YOUR NEEDS

BRAWN...

that stands up to the toughest jobs

Up to 1,000 pounds greater built-in weight gives the new International® 350 Utility *capacity and stamina unsurpassed in the utility tractor field!* Give us an opportunity to *prove* it . . . simply ask for a demonstration. *See* how greater built-in weight gives full-bucket backhoe bites to step up trenching yardage . . . how *full-load traction* speeds up all dozing and loading operations.

Response like you've never known, with *all-tractor* gasoline, diesel, or LP gas engine . . . the power you need for time-saving *capacity!*

Try it! Your IH Dealer will gladly demonstrate . . . just phone him. For free catalog, write International Harvester Company, Dept. RS-4, P. O. Box 7333, Chicago 80, Illinois.

SEE YOUR INTERNATIONAL HARVESTER DEALER

International Harvester products pay for themselves in use—McCormick Farm Equipment, Farmall and International Tractors . . . Motor Trucks . . . Construction Equipment—General Office, Chicago 1, Illinois.

. . . for more details circle 287, page 16

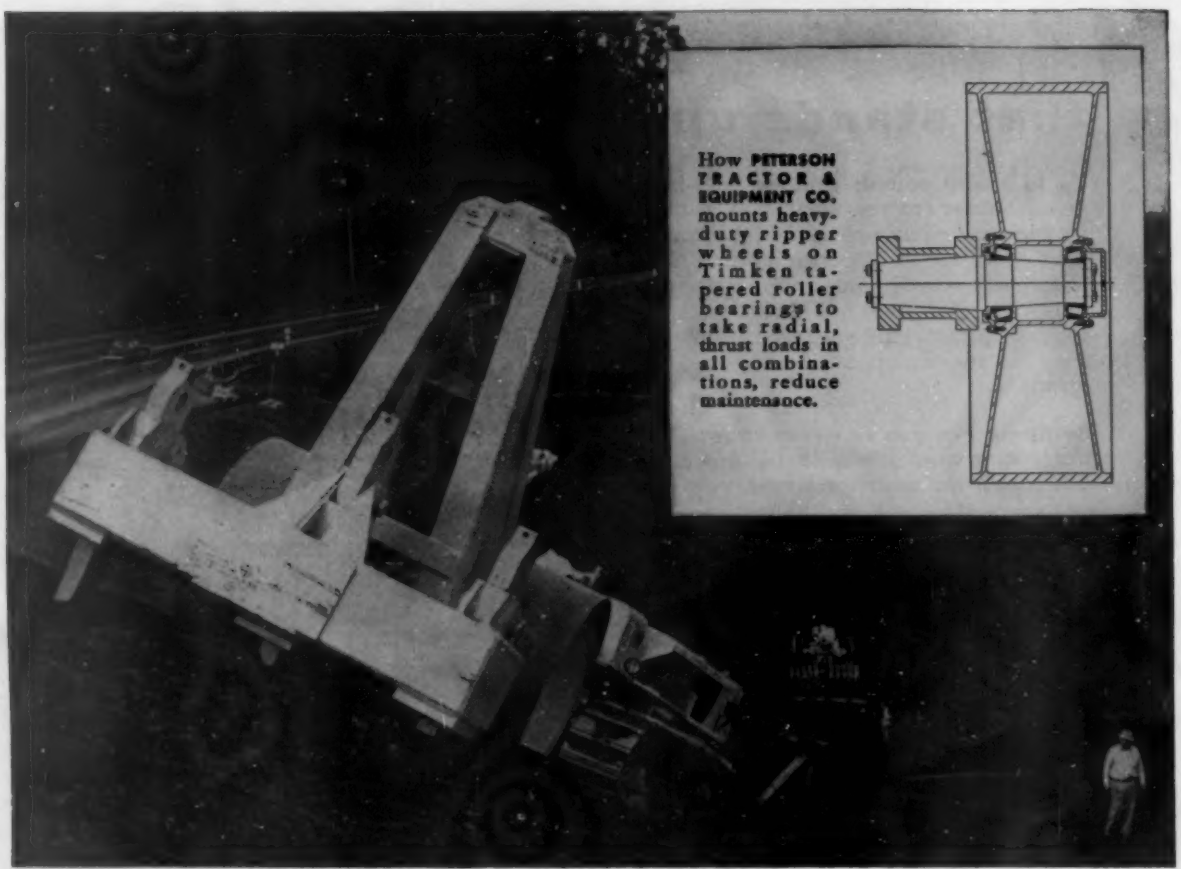
Largest, huskiest pull-type ripper ever made breaks solid rock–rides on TIMKEN® bearings

PETERSON Tractor & Equipment Company's 17-ton heavy-duty ripper does work formerly done by dynamite blast—rips dirt, shale, stone, soil, even solid rock strata, to depths up to 5 feet. Total weight of unit is about 35,000 lbs. From 1 to 6 tractors pull this ripper, depending on rockiness of soil. Steel drum wheels, 24" wide x 60" diameter, are mounted on Timken® tapered roller bearings.

Timken bearings, because of their tapered construction, can take radial and thrust loads in all combinations. Their geometric design gives true rolling motion, practically eliminates friction. Full line contact between rollers and races means extra load-carrying capacity. Every cup, cone, and roller is case-carburized, giving them hard, wear-resistant surfaces over tough, shock-resistant cores, to take heavy shock loads. By holding shafts and housings concentric, Timken bearings make closures more effective in keeping out dirt, dust, water, keeping lubricant in.

Timken bearings are precision-made, with quality controlled all the way from melt shop to final bearing inspection. We even make our own steel, something which no other American bearing manufacturer does. So . . . when you build or buy construction equipment, look for the trade-mark "TIMKEN" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



How **PETERSON TRACTOR & EQUIPMENT CO.** mounts heavy-duty ripper wheels on Timken tapered roller bearings to take radial, thrust loads in all combinations, reduce maintenance.

TIMKEN *TAPERED ROLLER BEARINGS ROLL THE LOAD*

TRADE-MARK REG. U. S. PAT. OFF.

. . . for more details circle 333, page 16

ROADS AND STREETS
Sixty-Five Years of Editorial Leadership

Washington News Letter

By Duane L. Cronk May 10, 1957

"Scandals" involving state highway departments around the country are bobbing into public print, much to the dismay of not only local roadbuilders but national industry leaders. In Pennsylvania, the state highway department has been vigorously attacked by an influential Pittsburgh newspaper.

In a barrage of extremely critical articles and editorials, the newspaper declared that millions of dollars worth of construction is being delayed by poor management and political meddling. In Indiana, alleged right-of-way manipulations have hit the headlines and provoked a rash of accusations and talk of Grand Jury action.

* * *

There have been immediate reverberations in Washington. Senator Albert Gore, chairman of the Senate Subcommittee on Roads, ordered two committee investigators out to probe the Indiana affair. The Bureau of Public Roads cut off all federal aid for right-of-way to the state pending findings of its own investigation. Because labor officials are involved, the Senate's special labor racketeering committee said it, also, will look into the matter.

Such developments have "good roads" leaders in Washington shaking their heads and crossing their fingers. The big highway construction program, with its billions of dollars of public tax monies being poured into the market at record pace, is potential dynamite. Even isolated instances of collusion, fraud, or mismanagement will be detrimental to the National Highway Program, they believe.

> As one Senator told Roads and Streets, "Uncle Sam is in this thing too deep to overlook discrepancies anywhere. We're talking about 90% federal participation these days, and we are going to be very much interested in any alleged misuse of those funds."

* * *

Congressmen expressed alarm last month, also, over a so-called "raid" on the Highway Trust Fund by the Labor Department. It came out in the course of appropriation hearings that the department was given $365,000 from the fund to administer the federal labor laws just recently applied to Interstate System highway jobs and so unpopular among contractors and highway departments.

This is adding injury to injury to the industry. Congressman Hale Boggs, who drafted the financial provisions of the National Highway Program, is highly incensed. Highway user taxes going into the trust fund are specifically earmarked for construction, he insists, and to permit diversion of such revenues to any other use would "completely and totally violate every concept of the Highway Trust Fund."

(continued on next page)

Reimbursement of utility companies out of federal-aid funds for relocation of their facilities was attacked last month by another Congressman. Robert Jones, hearing that numerous state legislatures are under pressure to change the state's traditional policy of not paying such costs, promptly introduced a bill which would prohibit use of federal funds for reimbursement. "We didn't vote those highway user taxes to provide give-away money to the utilities," he declared. His bill would even prohibit use of the right-of-way by utility companies except where necessary to cross the highway.

(When the Colorado legislature last month voted to reimburse utilities for relocation necessitated by new highway construction, the Denver Post expressed its dismay. "Sneakiest of all arguments for the utility bill," it said, "is the one that the principal cost will be borne by the federal highway fund, so why should the state object?")

* * *

Bid prices are up substantially in some states, first returns from a Roads and Streets survey indicate. For examples, Maryland reports March '57 bids over 12% same month last year; Texas' first quarter price index is 6% over first quarter of '56; and California costs are already up 8% over the highest peak in 1956. Complete state by state round-up of construction progress, costs and legislation will be published soon.

* * *

A new division in the Bureau of Public Roads to act as the development and industry liaison branch of the agency is in the making. A number of Washington industry representatives have applauded the idea. Fostering and promoting modern engineering techniques, such as use of electronic computers and photogrammetry, will be among the first duties of the new unit.

* * *

It will take 16 years to complete the National Highway Program instead of 13, Federal Highway Administrator Bertram D. Tallamy told a Senate Committee last month, under the financing provisions of the program drafted last year. A pay-as-you-go clause in the Act prohibits appropriation of funds in excess of revenues, Mr. Tallamy pointed out, and the funds Congress authorized cannot possibly be matched by revenues anticipated during the 13-year period.

Income will equal authorizations for the first three years (1957 to 1959) but thereafter - for 10 years - the funds hoped for from the new and increased highway user taxes will be less than enough and the program authorizations will have to be cut back accordingly. By 1959, the accumulated deficit will be nearly $5 billion.

If the revenues are not boosted and appropriations remain tied to the present revenue structure, volume will not climb to a peak of $8 billion a year and then level off for a 10-year period as first predicted, but will climb slowly and steadily throughout the entire 13-year period, following the increase in revenue.

ANOTHER CATERPILLAR FIRST!

CERTIFIED POWER

FOR CAT* DIESEL ENGINES

CATERPILLAR TRACTOR CO.

ENGINE POWER CERTIFICATION

This is to certify that the Diesel Engine herein described has been engineered, manufactured and tested in accordance with rigid Caterpillar Standards. The materials and workmanship incorporated into this engine give it the inherent capacity for satisfactory performance when applied in accordance with the power ratings established and recommended by this company. The MAXIMUM OUTPUT capacity of this standard production engine is 200 H.P. @ 2000 R.P.M. equipped with: air cleaner, water pump, lubricating oil pump, fuel pump, and standard intake and exhaust manifolds.

I certify that B. L. Henson, Supervisor of Diesel Engine Test, Caterpillar Tractor Co., ... Certification and I affix my ... 19 57

B. L. Henson
Supervisor Diesel Engine Test
Caterpillar Tractor Co.
Peoria, Illinois

... /58

Caterpillar Model D326 Industrial ... was manufactured and shipped as follows: Engine Serial No. 39B1018 Shipping Date February 11, 1957

Power Setting 152 H.P. @ 1600 R.P.M. Intermittent Power Rating

Additional Equipment:

Radiator & Fan	Tachometer Drive
Ether Starting Aid	Muffler
32V Charging Generator	Heater Connections
Governor Control	Remote Shut-off

POWER RATINGS

MAXIMUM OUTPUT is the horsepower capacity of the engine, a measure of the maximum power, ± 5%, that can be developed for five minutes without drop in speed.

INTERMITTENT HORSEPOWER is a rating for use in variable load applications such as excavators, hoists, and standby power units, where the duration of sustained full power output is one hour or less, with the average output not over 80% of Intermittent Horsepower.

RATED HORSEPOWER is a rating for use in applications such as planing mills, hammer mills, and rock crushers where the duration of sustained full power output is 12 hours or less.

CONTINUOUS HORSEPOWER is a rating for use in applications such as work boats and pumps where the duration of sustained full power output is 24 hours per day, day in—day out.

Horsepower figures are established in accordance with rigid Caterpillar standards. All ratings, corrected to sea level barometric pressure (29.92 in. Hg.) and standard temperature (60°F), apply to a production engine including air cleaner, water pump, lubricating oil pump, fuel pump and standard intake and exhaust manifolds. The above ratings are based on British and American DIN.

Printed in U.S.A.

FORM NO. 615-33553

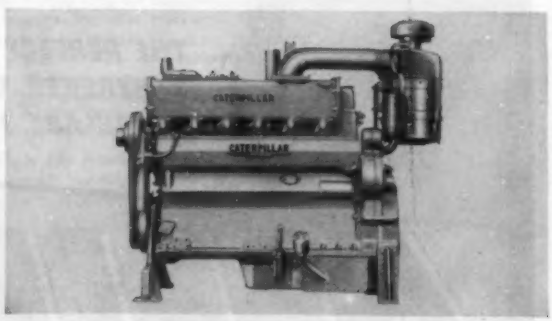
In a quarter century of diesel leadership Caterpillar Engines have achieved a reputation for *honestly rated power*. Owners have found that they can depend on a Cat Diesel to deliver the power promised.

Now, to back this reputation, Caterpillar becomes the *first* manufacturer to issue a certificate showing the horsepower capabilities of the engine. This certificate is signed by Caterpillar Tractor Co. and certified by a notary public.

You have a right to demand *certified power* when you invest in an engine. You get it when you buy from your Caterpillar Dealer. Let him show you the certified power plant that fits your needs.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

. . . for more details circle 256, page 16



CATERPILLAR*

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ALLIED JET SEAL

the one joint seal that . .

RESISTS JET FUEL, HEAT AND BLAST

Allied JET SEAL will not be blown from the joints by the blast and heat of jet engines even after prolonged exposure. Nor is Allied JET SEAL affected by jet fuel, oil and solvents.

GIVES LONGER LASTING TROUBLE FREE ROAD SEALING

The extreme ruggedness of Allied JET SEAL combined with its superior qualities of adhesion, cohesion, resilience and ductility at low temperatures makes it the ultimate for highway sealing. Though the initial cost of Allied JET SEAL is slightly higher it is far more economical over the long run since its expectant life is more than 250% greater than presently used materials.

HAS NO VERTICAL OR OVERHEAD FLOW ON BRIDGES

Allied JET SEAL has no cold flow tendencies even at temperatures in excess of 300°F., thereby assuring that it will remain where placed. This advanced characteristic makes it possible to seal vertical and overhead bridge joints without loss of material due to gravity flow.

Allied Materials Corporation also manufactures regular joint sealing compounds meeting Federal Specifications SS-S-164 and SS-S-159. Write for additional information.

THE PERFECT SEAL WHEREVER CONCRETE SLABS ARE JOINED

ALLIED MATERIALS CORP.

PRODUCERS, REFINERS AND COMPOUNDERS FOR OVER 25 YEARS

GENERAL OFFICES—
Braniff Bldg., Oklahoma City, Okla., Phone RE 9-0592
PLANTS—Stroud, Okla.; Detroit, Mich.; Los Angeles, Cal.; New Market, N.J.; Brantford, Ontario (Canada)

. . . for more details circle 235, page 16

Headlines

"Library" of Computer Data Planned by Bureau

The Bureau of Public Roads is in the process of establishing a library of computer programs. In making this announcement to the state highway departments, B. D. Tallamy, Federal Highway administrator, urged the state highway departments to speed up their adoption of the new computer techniques and to cooperate with this plan.

Noting that the progress made to date has been achieved only through much study and effort by the individual highway department groups, Tallamy said in his memorandum, "In many cases, the analysis of an engineering problem and the development of an electronic computer program for its solution may involve several months of concentrated work. In order to avoid costly duplication of effort and gain maximum advantage from it, the bureau is in the process of establishing a library of computer programs.

"The function of this library is to maintain in verbal or block diagram form and in current status the electronic computer program developed in the state highway de-

(Continued on page 24)

THE COVER SCENE

This month's cover scene was snapped by the editor on the paving job of J. A. Jones Construction Co. on the U.S. 30 bypass near Mansfield, Ohio. This 1956 project marked the introduction of a new batch body hoist, shown in action here. The hoist, mounted on a Ford F-750 Big Job truck, was designed to the contractor's specifications by Hercules Steel Products Co. It shortened the raise-dump-lower cycle to 10 seconds or so, resulting in better synchronization with the theoretical fastest-possible cycle of the Rex 34E dual-drum paver.

The details of this job and the equipment innovations developed on it were described in Roads and Streets, February, 1957, in article "Innovations Stepped Up This Concrete Paving Job."

now, in contractor tools, too,

if it's Remington, it's right!

12 outstanding features make the TG4 the most efficient power trowel ever designed!

Model TG4 Power Trowel. 2½ hp., 4-cycle, 1 cylinder, air cooled gasoline engine; dust and moisture proof magneto, adjustable governor; available with 26" ring (TG4-26) or 36" ring (TG4-36).

These twelve features make the Remington TG4 Power Trowel by Mall the most advanced on the market. Hundreds of contractors already know it as the finest performing, easiest to handle, most versatile gasoline driven troweling machine they have ever used. Here are the twelve features. Compare them with other makes!

1. **Powerful 4-cycle, air cooled, 2½ hp. gasoline engine for fast, steady finishing.**
2. **Direct gear transmission delivers 97% of power to blade. No slipping belts to steal valuable power and reduce efficiency.**
3. **Lifting eye for raising or lowering machine from floor to floor.**
4. **Automatic recoil starter—fast, easy—no lost rope, no waste of time.**
5. **Exclusive! Quick-kick pitch adjustment ring. All three blades adjust at once. No bending—just a kick of the foot does it!**
6. **Low center of gravity design for easy operation.**
7. **Centrifugal clutch—engine disengages at idling speed. Promptly engages as engine speed increases.**
8. **Reversible shoes and blades of high-grade steel. Both edges can be used, giving double wear!**
9. **Extra strong ⅞" diameter, solid ring in 26" and 36" sizes.**
10. **Clamp ring for switching to a replacement engine in seconds. No belts, nuts or bolts to bother with!**
11. **Safety throttle control. Release handle and ring stops, engine idles. No stalling—no restarting necessary.**
12. **Floating disc attachment to smooth dry tamp floors (minimum water content) and grinding-grouting head to dry grind or wet grout concrete floors can be quickly and easily mounted in blade arm sockets.**

Only the Remington TG4 by Mall has all these advanced, time-saving features! And the TG4 is built with the quality and precision that have made Remington famous for 141 years in sporting firearms and ammunition.

For full information about the complete Remington line of Mall contractor and industrial tools, including concrete vibrators, earth augers, circular saws and many others, just send the convenient coupon.

Remington

Mall®

MALL TOOL COMPANY
Division of Remington Arms Company, Inc.
25000 S. Western Ave., Park Forest, Illinois.

. . . for more details circle 304, page 16

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Please send free catalog on contractor and industrial tools.

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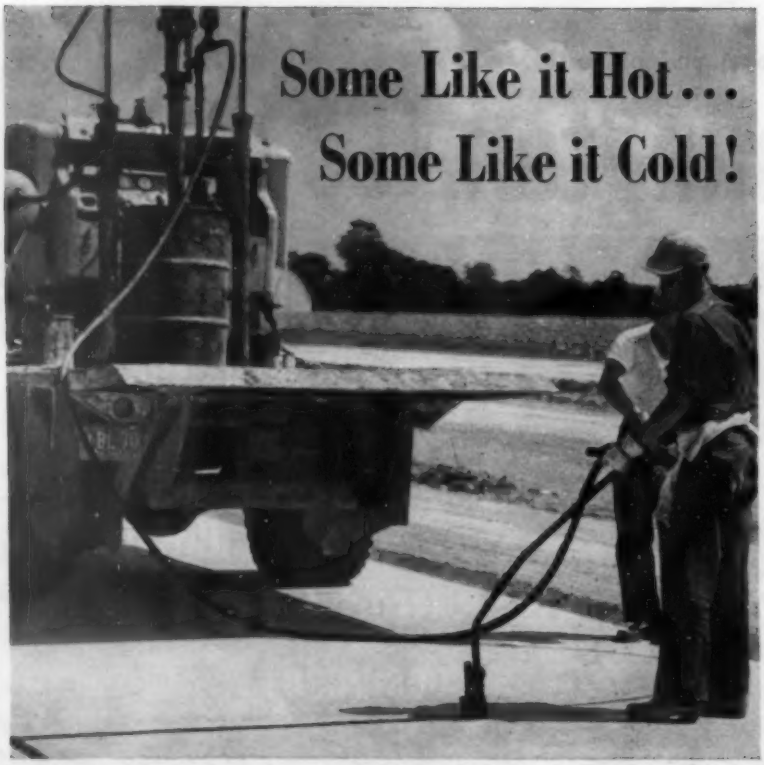


but whatever your preference in paving joint sealers . . . you're sure of top quality performance

with **PRESSTITE-KEYSTONE Paving Products**

Whether you're a cold-applied advocate or a proponent of the hot pour—PRESSTITE-KEYSTONE offers you the latest and the finest in both types of paving joint sealers.

These two reliable names are your assurance of controlled quality, dependable delivery and a personalized engineering service. Add to this your advantages of one complete buying source, one convenient inventory and billing account, plus the big savings of mixed-carload shipment.

make* PRESSTITE-KEYSTONE *your one-stop source for all your paving product needs

- Presstite Cold-Applied Joint Sealer #67
- Kapco® Hot Pour Asphalt Rubber Joint Sealing Compound
- Kapseal® Crack Filler
- Presstite Cold Applied Jet Airfield Joint Sealer #99
- Kapco® Hot Pour Jet Airfield Joint Sealer

ALSO: All types of pre-formed Expansion Joints, Tongue & Groove Joints, Concrete Curing Compounds, etc.

PRESSTITE SEALING COMPOUNDS — PRESSTITE-KEYSTONE ENGINEERING PRODUCTS COMPANY — K A P

A Division of AMERICAN-MARIETTA COMPANY
3782 CHOUTEAU AVENUE, ST. LOUIS 10, MISSOURI

. . . for more details circle 316, page 16

Headlines

(Continued from page 22)

partments, the bureau, and other highway engineering organizations. Incoming material will be subjected to engineering analysis and correlation and then made available to any state on request. Each state may then have the advantage of all developments in the field before undertaking additional effort."

The initial work will be to compile copies of computer programs already developed and descriptions of additional programs in the development stage. The finished programs are requested to be in either descriptive or block diagram form and not in computer code so that they can be readily adapted for use on any digital computer.

Tallamy noted that some states have not as yet undertaken the use of electronic computers but are considering doing so. To help the states get started, the services of various engineers in the bureau experienced with electronic computer work are offered. The state engineers are requested to address their problems to H. A. Radzikowski, in the Bureau in Washington, in whose office will center the responsibility for this correlation service.

Heavy Trucking in Colorado

A state-wide Loadometer study was made recently by the Colorado State Highway Department's Division of Planning and Research, for which Robert E. Livingston is engineer. Some of the highlights of their findings, compared with similar studies two decades ago:

1. All traffic has increased 90% on the average between 1936 and 1956 on state highway system.

2. Percentage of trucks to total traffic has remained relatively stationary in this time, being 6.93 in 1936 and 7.70 in 1956.

3. The big change was in the types of trucks. The number of single-unit trucks has increased only one-fifth since 1936, while combination vehicles have multiplied more than six times. Truck-trailer combinations today constitute 4.81 percent of the total traffic flow on the state system.

4. The survey report, prepared to aid in road planning and design, states: "It seems apparent that the number of larger vehicles, the num-

(Continued on page 26)

Headlines

(Continued from page 24)
ber of larger gross loads and the number of larger axle loads are increasing at a much faster rate than any other increment of truck traffic.

5. Overweight violations of state law detected at various Loadometer stations ranged from 0.88 to 48.97 percent per vehicle.

Large Aerial Survey Program Planned in N. Carolina

One of the largest aerial surveying and mapping contracts ever awarded for highway development in the southeast has been given to Air Survey Corporation of Arlington, Virginia, by the North Carolina State Highway & Public Works commission.

Over 1400 square miles of low altitude flying is involved, along with 156 square miles of large-scale topographic mapping, and several hundred lineal miles of ground surveying and establishment of permanent survey markers.

The purpose is to determine the most feasible locations for new highways under the federal program. Permanent survey markers will be used to locate final designs on the ground.

Meetings

AMERICAN SOCIETY OF CIVIL ENGINEERS—Summer meeting, Statler Hotel, Buffalo, N. Y.—June 3-7.

NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS—Annual meeting, Statler Hotel, Dallas, Texas—June 6-8.

WESTERN ASSOCIATION OF STATE HIGHWAY OFFICIALS—36th annual conference, Shamrock-Hilton Hotel, Houston, Texas—June 11-15.

SCHOOL FOR HIGHWAY SUPERINTENDENTS—Cornell University, Ithaca, N. Y.—July 8-10.

WORLD CONFERENCE ON PRESTRESSED CONCRETE—Fairmont Hotel, San Francisco—July 29-August 2.

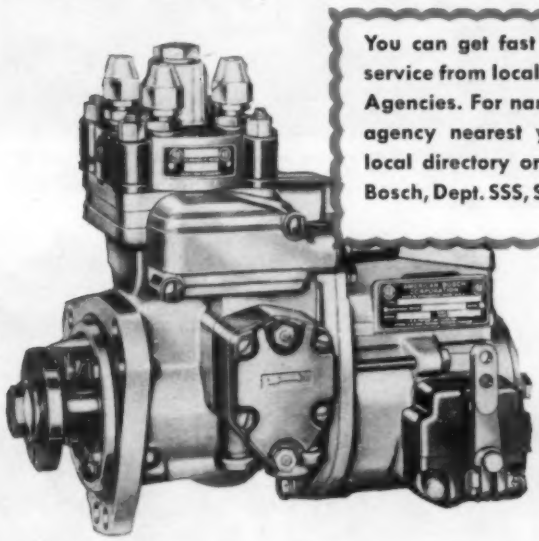
AMERICAN SOCIETY FOR TESTING MATERIALS—Pacific area national meeting, Sheraton Palace Hotel, San Francisco—September 13.

AMERICAN PUBLIC WORKS ASSOCIATION—Annual public works congress, Philadelphia—September 22-25.

Reminder: Payrolls Required On All Interstate Work

Under the provisions of the 1956 Federal Aid Highway Act, the contractors on interstate projects will be required to furnish certified copies of payrolls to the department of highways for filing with the Bureau of Public Roads. These payrolls must include name and address of employee, his classification, rate of pay, daily and weekly hours worked, the deductions made and the net amount of wages actually paid.

No forms have been developed for this purpose and until the bureau prepares such forms the contractor must use his own. This is a burdensome process and will require considerable time in order to comply with the regulations. This element of cost should not be overlooked in figuring these projects, notes a bulletin from the Virginia Road Builders Association.



You can get fast and economical service from local American Bosch Agencies. For name of authorized agency nearest you, check your local directory or write American Bosch, Dept. SSS, Springfield, Mass.

the PSB fuel injection pump

UNEXCELLED

. . . for performance and outstanding service—that's the acknowledged record of more than 140,000 American Bosch PSB pumps now in use.

Here's some reasons why! Simple construction . . . fewer parts . . . accurate fuel metering and distribution . . . positive governor control . . . replaceable hydraulic head for fast field servicing.

What's more—all American Bosch fuel injection products are backed by a growing system of authorized service agencies, fully equipped to provide quick, efficient repair service.

Unequaled value—for top diesel engine performance and economy of operation . . . long trouble-free life . . . lower maintenance expense—nothing equals a PSB fuel injection pump.

AMERICAN BOSCH

Division of

American Bosch Arma Corporation

Springfield 7, Mass., U. S. A. 4493-B

. . . for more details circle 241, page 16

LIMA

Users across the nation find LIMA Cranes tops in flexibility, speed and dependability

Like hundreds of others across the nation, the contractors on these three jobs find Limas ideal for transferring concrete, lifting structural steel into place, in fact, all types of materials handling. They find Limas give smooth, precise lifts, move swiftly, stay on the job year in, year out with a minimum of maintenance.

Check these Lima quality features: Moving parts flame or induction hardened for longer life; weight distributed for maximum stability; anti-friction bearings at all important bearing points; big-capacity drums and sheaves that are easy on cables; propel and swing gears and power take-off enclosed in a sealed oil bath; torque converter (optional).

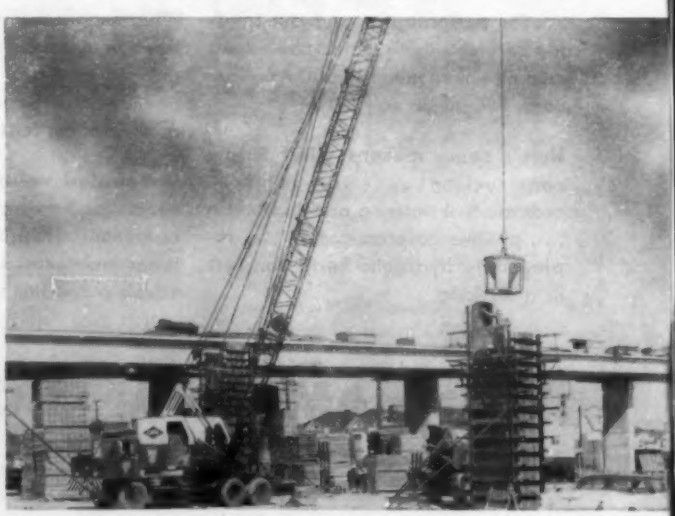
Mounted on rubber for maximum mobility, Limas are available on 6x4, 6x6, 8x4 and 8x6 carriers with capacities up to 60 tons and will go anywhere a truck will go at speeds up to 25 mph. If mobility is not a factor in your operation, you can get crawler-mounted Lima cranes that will handle loads up to 110 tons. And readily interchangeable front end attachments—shovel, dragline and pullshovel—give Limas the versatility to handle any of your heavy lifting and digging jobs.

Get the complete LIMA story from your nearby Lima distributor, or write Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.

DISTRIBUTORS IN PRINCIPAL CITIES OF THE WORLD

Two Lima Type 703-SC cranes, equipped with 70′ booms and 20′ jibs, hoisting 110′ long steel girder weighing 76 tons on the construction of a bridge over the Calumet River on the East-West Indiana Turnpike.

Lima Type 34-T truck crane handling concrete bucket for a paving project on Route 28 near Elizabeth, New Jersey.



Lima Type 44-T truck crane pouring concrete into bridge pier form on the West Coast's largest freeway at Oakland, California.

. . . for more details, circle 246, page 16

LIMA SHOVELS • CRANES • DRAGLINES • PULLSHOVELS

BALDWIN-LIMA-HAMILTON

Construction Equipment Division—LIMA WORKS

OTHER DIVISIONS: Austin-Western • Eddystone • Electronics & Instrumentation • Hamilton • Loewy-Hydropress • Madsen • Pelton • Standard Steel Works

Announcing the all-nylon

B.F.Goodrich

ROCK SERVICE TUBELESS

FOR MINES

QUARRIES

DIRT-MOVING JOBS

FLEX-RITE construction prevents unnecessary tire failures!

THE new B.F.Goodrich Rock Service tire—unlike an ordinary tire—is *built to its inflated shape*. When inflated, the tire body is not distorted. The whole tire flexes evenly, uniformly. No *localized* stresses that often cause unnecessary tire failures. FLEX-RITE construction eliminates this major cause of tire trouble and expense!

New B.F.Goodrich Rock Service tires are built with FLEX-RITE nylon cords. There are no cross threads to rub and chafe, creating tire-killing heat. FLEX-RITE nylon cords withstand double the impact of other materials, resist heat blowouts and flex breaks. Result: more retreadable Rock Service tires.

Greater traction! Puncture protection!

The double chevron tread gives maximum traction and skid resistance in forward or reverse. Rugged sidewalls defy rock bruises. V-shaped grooves expel stones. B.F.Goodrich Tubeless construction runs cooler, protects against punctures, cuts maintenance costs, is easier to service.

See the new, money-saving Rock Service nylon tire at your B.F.Goodrich dealer's today. It's the most advanced tire on the market today built for off-the-road hauling. *B.F.Goodrich Tire Co., A Division of The B.F.Goodrich Co., Akron 18, Ohio.*

Specify

B.F.Goodrich tires when ordering new equipment

B.F.Goodrich
FIRST IN RUBBER

Your B.F.Goodrich dealer is listed under Tires in the Yellow Pages of your phone book

. . . for more details circle 276, page 16

on the West Coast's largest freeway at Oakland, California.

Euclid...the most complete

Euclid's expanded line of earthmoving equipment gives you the biggest range of types and capacities in the industry. Whatever your requirements may be—for a small grading job or a multi-million yard project—there are "Eucs" that will move more dirt at lower cost than other equipment.

7 REAR DUMPS

Payload capacities of 10, 12, 18, 22, 35, 40 and 50 tons...128 to 600 total h.p....5 and 10-speed transmissions and Torqmatic Drives... top speeds with full payload up to 36 mph.... overhung engine tractor models have 12 and 35-ton capacity semi-trailer bodies that are interchangeable with 7 and 18-yd. scrapers.

A new concept in tractor design, Model TC-12 has exceptional maneuverability and ease of handling. Each track has a separate power train with 218 h.p. engine and Torqmatic Drive for a total of 436 h.p.... speeds up to 8 mph. forward or reverse..."on-the-go" shifting...8 track rollers and 27" track shoes for balance and stability.

CRAWLER TRACTORS

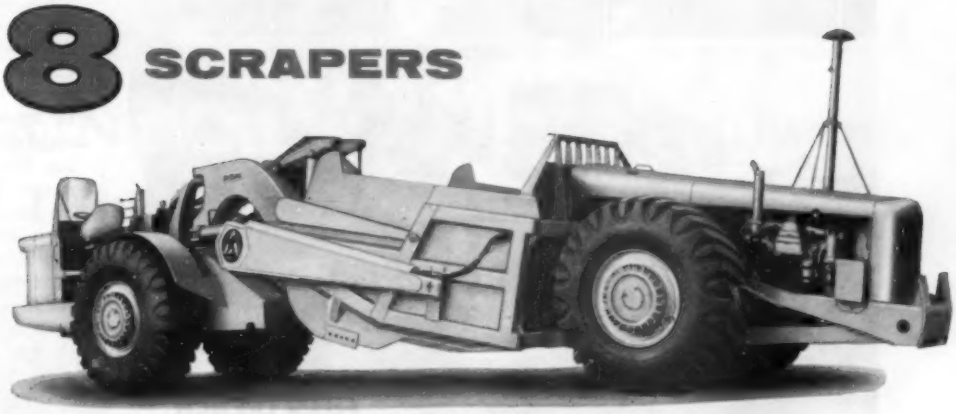
The TC-12 is the first production model of a complete line of crawler tractors now being developed and field tested by Euclid. It can be equipped with hydraulic or cable controlled blades and other heavy duty attachments.

EUCLID DIVISION, GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

line of JOB-PROVED earthmovers

Three types of scrapers with struck capacities of 7 to 24 yds.—9 to 32 yds. heaped . . . 143 to 518 total h.p. . . . standard gear transmissions and Torqmatic Drive . . . hydraulic lever action of bowl, apron and ejector . . . overhung engine scrapers have struck capacities of 7, 12 and 18 cu. yds. . . . 4-wheel tractor models carry 12, 18 and 24 yd. payloads struck.

8 SCRAPERS



Twin-Power models have 18 and 24 yd. struck capacity—25 and 32 yds. heaped . . . two engines, each with separate Torqmatic Drive for tractor and scraper axles . . . 436 and 518 total h.p.

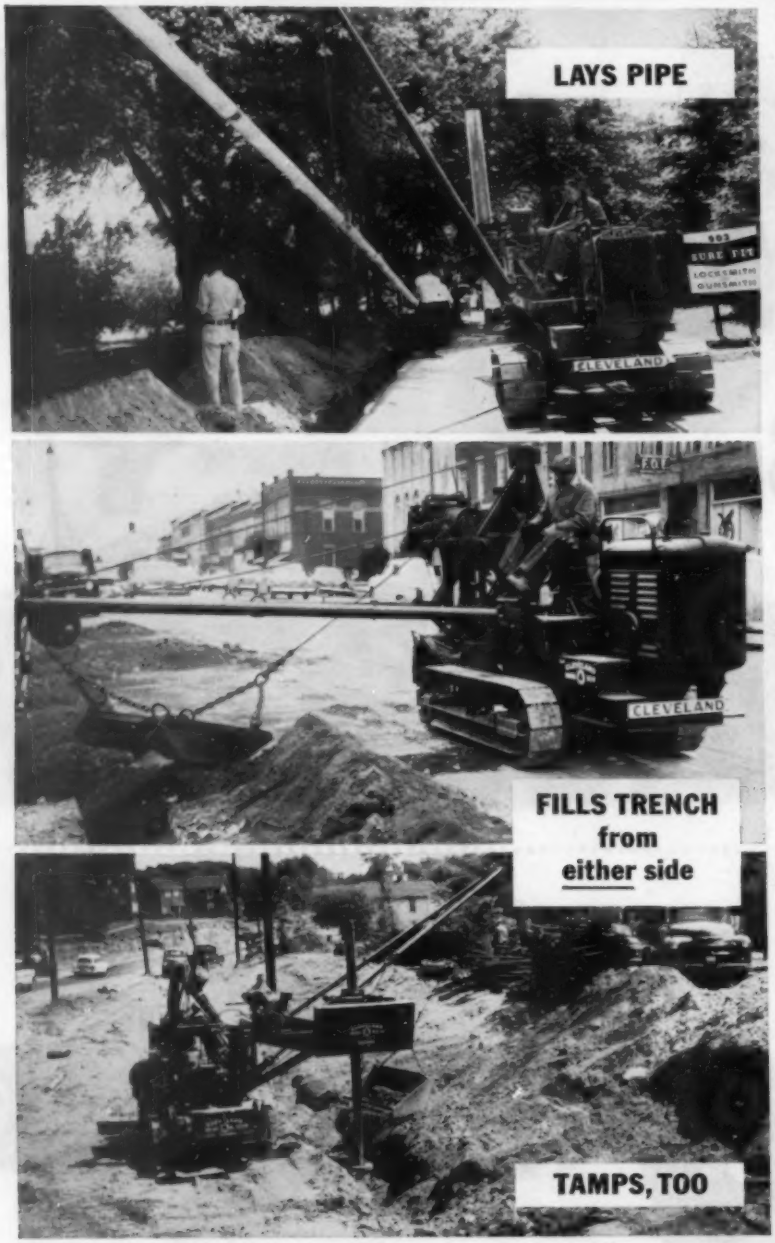
4 BOTTOM DUMPS

Struck payload capacities of 13, 17 and 25 yds.—19 to 38 yds. heaped . . . 218 and 300 h.p. . . . Torqmatic Drive and standard gear transmissions . . . loaded speeds to 34 mph. . . . overhung engine Model S-12 has 13-yd. struck capacity.

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

The Cleveland 80W ...a real money maker



Does All 3 Jobs Better...with Only 1 Man

THE CLEVELAND TRENCHER CO.

20100 ST. CLAIR AVENUE • CLEVELAND 17, OHIO

Good Everywhere

. . . for more details circle 262, page 16

Personals

Corrugated Pipe Group Elects

The Corrugated Metal Pipe Association, at its second annual meeting in Chicago in March, elected as 1957 president F. M. Wilkins of Eaton Metal Products Corp., Omaha, Neb.

This association, with Roy E. Smith as managing director, has headquarters at 140 South Dearborn St., Chicago, Ill., and serves pipe manufacturers in nine middle western states.

FRANCIS H. FALKNER, colonel, CE, USA, retired, has been appointed chief engineer of the Los Angeles office of Porter, Urquhart, McCreary & O'Brian, consulting engineers. Colonel Falkner has a broad background in public works and military construction, gained during 28 years with the Corps of Engineers. During his military service he has held the positions of resident member, Board of Engineers for Rivers and Harbors; director, Waterways Experiment Station; executive officer, South Pacific division; and district engineer in Pittsburgh, Pa., Huntington, W. Va., and Honolulu, T. H. In his consulting position he will devote much of his effort to military construction and water resource development.

WALTER H. PRICE, chief of the Bureau of Reclamation at Denver, is the new president of the American Concrete Institute. Phil M. Ferguson, civil engineering department chairman, University of Texas, Austin, was elected vice president.

A. T. Goldbeck of Washington, D. C., former ACI president and recently retired engineering director of the National Crushed Stone Association, received the Henry C. Turner medal for "more than 40 years of quiet perseverance in the extension of our knowledge of concrete for use in highways and structures."

FRED BURGGRAF, Director of the Highway Research Board, Washington, D.C., and Chester P. Siess, Research Professor of Civil Engineering, University of Illinois, are among the three recipients of the 1956 research prizes awarded by the American Society of Civil Engi-

(Continued on page 36)

Ferti-Blast Guns spread dry granular fertilizer the fast, easy, new way. Here a two-man crew fertilizes 8 acres of roadside turf per hour.

AIR GUN and granular fertilizer speed low-cost turf maintenance

Each Ferti-Blast Gun unit costs $97.50, may be ordered direct from Chowning Regulator Corporation, Corning, New York. Photo below shows the needle used to jab fertilizer bags.

. . . for more details circle 311, page 16

Blow on granular fertilizer with a Ferti-Blast Gun! That's the practical new way to give roadside turf the food it needs for beauty and prevention of costly erosion. Highway and toll road departments using this easy, economical method report a three-man truck crew (driver and two gun operators) fertilize over 8 acres of turf per hour. The Ferti-Blast Gun has a range of over 75 feet, can reach high banks and other hard to get at places.

The ideal fertilizer for air-blast application is ARCADIAN® 12-12-12 the balanced plant food with dustless, free-flowing granules of high-crushing strength. For straight nitrogen, pelleted ARCADIAN A-N-L®, Ammonium Nitrate and UREA 45 are excellent. Granular lime can also be applied with a Ferti-Blast Gun.

Two gun operators work best together. One operator usually "fires" high and far, the other shoots low and close to the moving truck. All you need is a truck, Ferti-Blast Guns, and any compressor supplying 120 cfm at 100 pounds. The operator just stabs the fertilizer bag with a needle attached to the feed hose—and shoots.

Each Ferti-Blast Gun comes complete with feeder needle, feed line and air hose. For full information on the easy, economical way to air-blast fertilizer to roadsides and any turf area, fill in the coupon below.

NITROGEN DIVISION, Allied Chemical & Dye Corporation
40 Rector Street, New York 6, N. Y.

NITROGEN DIVISION ALLIED CHEMICAL

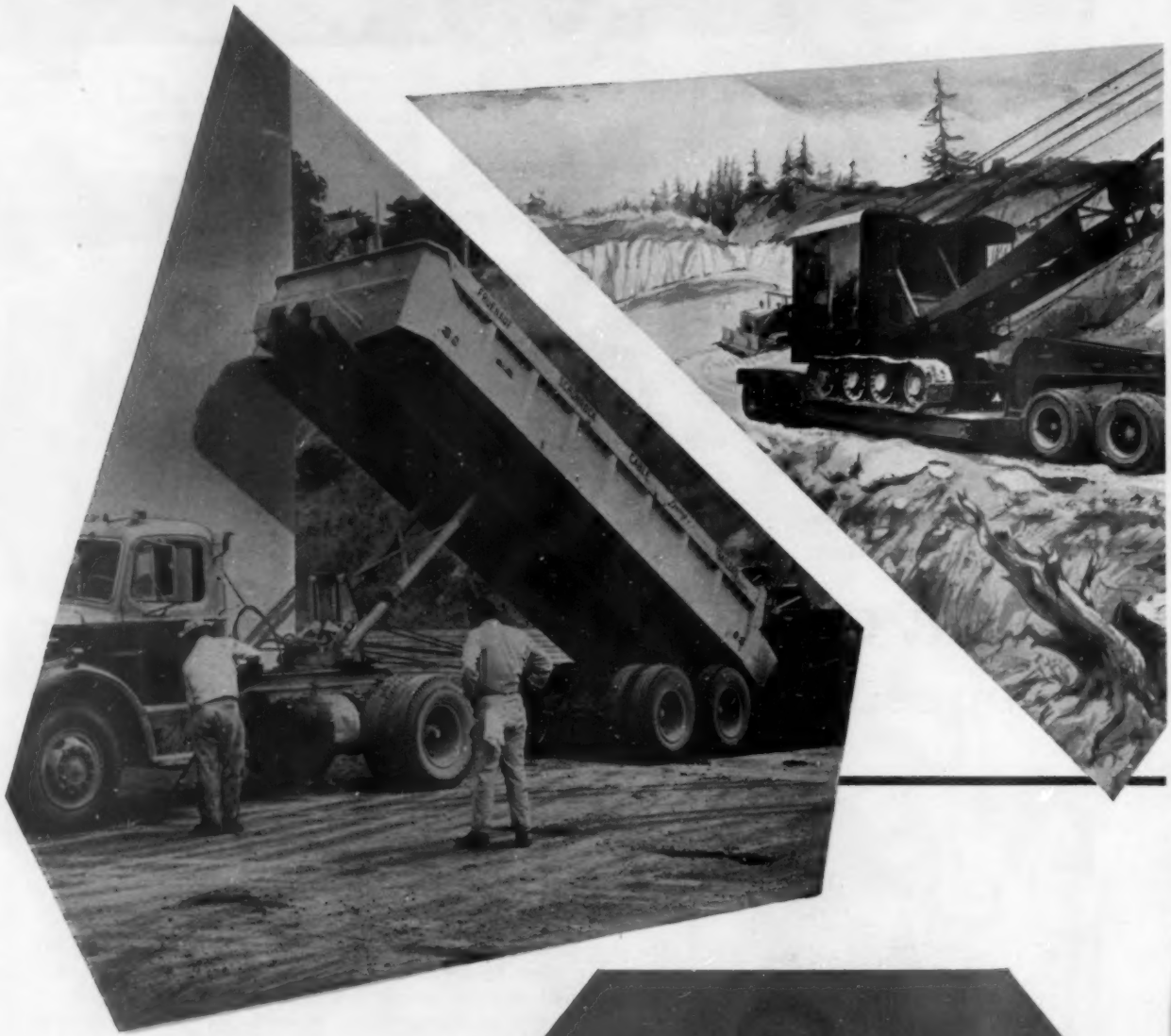
☐ Please send me details on ARCADIAN 12-12-12 and other high-nitrogen fertilizers for turf.

☐ Please send me full information on Ferti-Blast Guns.

Name_____ Title_____

Dept._____ Street_____

City_____ State_____



FRUEHAUF TRAILERS

"ENGINEERED TRANSPORTATION"

World's Largest Builder of Truck-Trailers

FRUEHAUF TRAILER COMPANY

10958 Harper Avenue • Detroit 32, Michigan

✓ **PLEASE SEND THE FREE LITERATURE ON FRUEHAUF CONSTRUCTION TRAILERS AT ONCE!**

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☆ *Fill in or just attach to letterhead and mail.*

THE EFFICIENCY OF YOUR

MONEYMAKERS

All roadbuilding contractors should be aware of the sizeable economies now made possible by innovations in roadbuilding Trailers in the complete Fruehauf line.

The new *Winchless Removable Gooseneck Carryall,* for instance, cuts front end unloading of heavy cranes and shovels to less than 15 minutes. The moneymaking *Fruehauf-Schonrock Cable Dump,* economical in cost and maintenance, delivers up to 4,000 lbs. more sand or gravel than conventional dumps, and is simple in design and operation. The *Airslide* Bulk Cement Transport* unloads cement or other pulverized materials at the rapid rate of 10 to 15 barrels per minute — with no mechanical device touching the commodity.

These provisions for speed, simplicity, and operating economy add up to increased profits every day, right now, for roadbuilding contractors. Send for illustrated literature!

*Trademark—Fuller Co.

FRUEHAUF FLEET IS PART OF YOUR ROADBUILDING PROFIT!

. . . for more details circle 346, page 16

Before you invest in make sure you get king—

Make sure you don't wear blinders when you invest in king-sized crawler power!
Make sure every dollar you invest buys the top pay-off power features. Look to the International TD-24 for the most profitable king-sized crawler performance your money can buy!

Make sure you don't dissipate dollars on a king-sized machine with load-limiting, "dead-track drag"!
The useful load of any king-sized, steering-clutch crawler is limited to what it can pull or push on turns. "Dead-track drag" hogs horsepower!

Exclusive and years-proved Planet Power steering gives the TD-24 full-time live power on both tracks. Upgrade or down, the TD-24 pulls or pushes its big loads on the turns or straight ahead, *with both tracks!*

Make sure you don't drop big money in high-priced time losses with "service-nervous" engine clutch complications!
The TD-24 gives you the operating ease, power-transfer efficiency, temperature-immunity, and service economy and simplicity of the International Cerametallic-faced engine clutch. And heat-defiant, long-lasting Cerametallic facings have amazing resistance to wear!

In your king-sized tractor, make sure you get your big money's worth—by getting the cycle-speeding advantages of TD-24 on-the-go shifting!
And compare how the TD-24's exclusive two-speed planetary system gives instant, stall-preventing Hi-Lo shifting without declutching in either the Torque-Converter or Gear-Drive models. You also get the added advantage of "no-stop" shifting with exclusive synchromesh transmission in the Gear-Drive model.

Make sure you don't fizzle away big finances by handicapping your operator—give him a break!
Give him TD-24 flush-deck design, control-tower vision, and reach-easy finger-tip controls to increase operator comfort and performance. Give him "one-engine" simplicity for seconds-fast starting and dependable diesel operation. Give him ALL of the dozens of other king-sized production-boosting TD-24 advantages!

Make sure you invest wisely and get full dollar value in giant-sized performance. See your International Construction Equipment Distributor for a TD-24 demonstration!

a king-sized crawler -sized performance!

With the TD-24 Torque Converter model as pusher, four International 75 Payscraper units prove able to outperform a fleet of six competitive self-propelled scrapers! Contractor, Terra Construction Co., Great Bend, Kansas, is handling a 500,000 cu yd grading job on Kansas 15, near the Nebraska line. "Perfect performance from all our International equipment," states Job Superintendent Weller.

"Where our other tractors failed this TD-24 has the stuff to get the job done," reports Mike Cashen, for Cashen and Erickson, Hibbing, Minnesota. "It is fast, easy to maneuver, and the only tractor we found that could load in these rocks." The job is building a tailings settling pond at a new Taconite plant in the Mesabi Iron Range. Because it's tough, the TD-24 wins the job of push-loading three self-propelled scrapers, and 'dozing boulders aside!

INTERNATIONAL® CONSTRUCTION EQUIPMENT

International Harvester Co., 180 N. Michigan Avenue, Chicago 1, Illinois

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.

. . . for more details circle 289, page 16

Stop ineffective, expensive patching procedure with modern "JAY" Tampers.

PROVED — in 48 states and 22 foreign countries "JAY" Tampers put bituminous asphalt down to stay, tighter in fact than a ten ton roller.

PROVED — "JAY" Tampers gave savings of 90% over old style compaction procedure.

PROVED — Portable, versatile, economical. Reported maintenance cost 80¢ per month per machine.
Be sure to see the "JAY" model 36 for larger areas.

THE "JAY" Company — write, wire, call or mail coupon today

170 Hosack St., Columbus 7, Ohio
Please send me additional information on the "JAY" TAMPER

My Name

Street

City Zone State

. . . for more details circle 355, page 16

Personals

(Continued from page 30)

neers. The award was made at the ASCE's recent winter meeting at Jackson, Mississippi.

Unique Plaque Given for Road Show Committee Job

Committee chairmen whose hard-working groups labored behind the scenes to make the Chicago Road Show a success are the recipients of a rather unique award "button." The huge medals bearing the legend "C I'M A Roads Scholar" were given by the directors of the Construction Industry Manufacturers Association to the various committee members for service "above and beyond the call of duty."

CIMA's retiring president, Kenneth Lindsay, executive vice president of Iowa Manufacturing Co., presented awards to Julien R. Steelman of the Koehring Co., chairman of the CIMA Road Show committee; Donald O. White of American Asphalt Pacing Co., chairman of the ARBA Road Show committee; C. J. Haring of C. J. Haring Co., chairman of Ground Rules and Space Qualifications committee; J. T. Callaway of the Goodyear Tire & Rubber Co., Inc., chairman of the Housing committee; Boyd S. Oberlink of Allis-Chalmers Manufacturing Co., chairman of the Space Allocations committee, and a member of the same committee, George C. Williams of Northwest Engineering Co., and Harvey A. Scribner of Russell T. Gray, Inc., chairman of the Publicity committee.

● **Kenneth Lindsay pinning "button" on Harvey A. Scribner for Road Show publicity job.**

Advertising material was prepared by the Russell T. Gray, Inc., agency, headed by Scribner. Direct mail material was prepared by three other organizations: Andrews Agency of Milwaukee, Richard T. Brandt, Inc., of Cleveland, and the advertising department of LeTourneau-Westinghouse at Peoria. All these groups donated their services.

Wyoming Staff Promotions

Recent job changes announced within the Wyoming state highway department: Glenn Shrum moves from assistant state construction engineer to assistant maintenance engineer; Oliver F. Baldwin, from district post at Rock Springs to assistant state construction engineer; W. G. Ainsley moves up to district maintenance engineer at Rock Springs; G. H. Saffell, district maintenance engineer, Sheridan.

Toncan Culvert Meeting

G. F. BEALL of Portland, Oregon, heads the Board of Trustees of the Toncan Culvert Manufacturers Association, as reported from its recent annual meeting in Cleveland. J. M. Wood of Memphis, Tennessee, and W. J. Sweeney of Groton, New York, are also Board members. Hubert E. Snyder of Cleveland was reappointed managing director and exofficio a member of the board.

COL. ALFRED H. DAVIDSON, JR., is appointed director of the Engineer Research & Development Laboratories at Fort Belvoir, Va. Col. Davidson, who has been with the Eighth Army in Korea, succeeds Col. H. F. Sykes, Jr., who is retiring from active service.

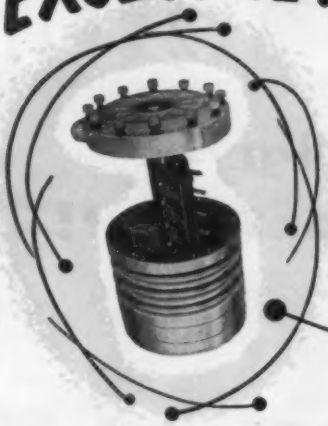
REX M. WHITTON, chief engineer, Missouri highway department, has been named chairman of the Highway Research Board's executive committee. He succeeds K. B. Woods of Purdue University.

Lester E. Jordan is the new district engineer for the Portland Cement Association at Philadelphia. He succeeds R. M. Reindollar, Jr., who has resigned to join a Baltimore engineering firm.

JACOB W. HOBECK, veteran road contractor of Holland, Mich., died recently at age 63. He founded and headed for 29 years the Hobeck Construction Co.

DON W. SHUPP, of Macco Corporation, Los Angeles, has been made president of the Gunite Contractors Association, Los Angeles.

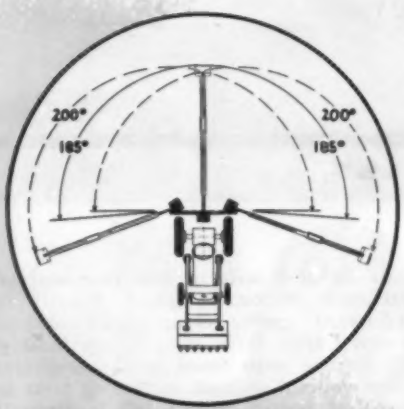
EXCLUSIVE!



NEW HYDRAULIC ROTARY BOOM SWING CYLINDER

DISCOVER DAVIS ...AND WHY IT WILL DO WHAT NO OTHER BACK-HOE CAN DO!

FLUSH DIGGING... with a 200° continuous operating arc... that's what the new Davis Model 210 does that no other machine can do. It will dig flush alongside buildings, fences, and other installations where you normally have to dig by hand! The exclusive hydraulic rotary boom swing cylinder and interchangeable mounting points on the frame are the key to its profit-making operation. The simple, compact cylinder with only one moving part replaces conventional swing rams, cables, and the inherent limitations as employed by all other back-hoes. The entire mast and boom assembly can be moved from center to either side for flush digging. It has smooth starts...cushioned stops, and because hydraulic pressure is constant, it permits a steady, controlled swing all the way around. This, plus all the other features that have made Davis America's largest selling back-hoe – right-angle operation, rotary seat, vertical stabilizer, 13' depth, and ***7,000 pounds of breakaway*** mean more jobs...more profit...less time on each job. Get complete information on both the new 210 and the popular 185 Davis Back-hoes today. Available for most popular tractors and 1-ton or larger flat-bed trucks.



PROVIDES 200° CONTINUOUS OPERATING ARC

This diagram illustrates the degrees of continuous operating arc from each of the three mounting locations – 200° when side mounted, or 185° center mounted. Has no pins to change or cable to break.

Davis Back-hoes and Loaders are sold and serviced everywhere in the U.S.A. and Canada by better dealers!

FOR THE NAME OF YOUR NEAREST DEALER CALL WESTERN UNION BY NUMBER, AND ASK FOR OPERATOR 25... *or write direct*

MID-WESTERN INDUSTRIES, INC.

1009 SOUTH WEST STREET DEPT. O WICHITA 15, KANSAS

... for more details circle 307, page 16

HAUL 6½ YDS. WITHIN

Low-weight chassis design of New Reo F-506M guarantees it!

POWERED BY REO'S OWN 170 hp GOLD COMET GAS ENGINE OR 160 hp LPG

BACKED BY REO'S OWN 100,000 MILE OR 1-YEAR ENGINE WARRANTY!

The certified chassis weight of Reo's new F-506M is 11,240 lbs. The official weighmaster's receipt proves how it can haul 6½ yds. of concrete and stay well within legal limits. The new Reo F-506M is designed and built specifically for mixer use. Its increased payload is made possible by Reo's new high-strength, low-weight *double-side-rail frame construction.*

The new Reo F-506M actually hauls up to 2 yards more than the average mixer chassis. And it places as much as 6,000 pounds more on the front axle than other conventional mixer trucks.

Reo full power steering, which is standard, makes maneuvering easy in tight places anywhere.

The new F-506M is powered by Reo's own 170 hp short-stroke, wet-sleeve Gold Comet Engine. Plenty of power for both truck and mixer. And, it's backed by Reo's famous *100,000 mile or one year warranty.*

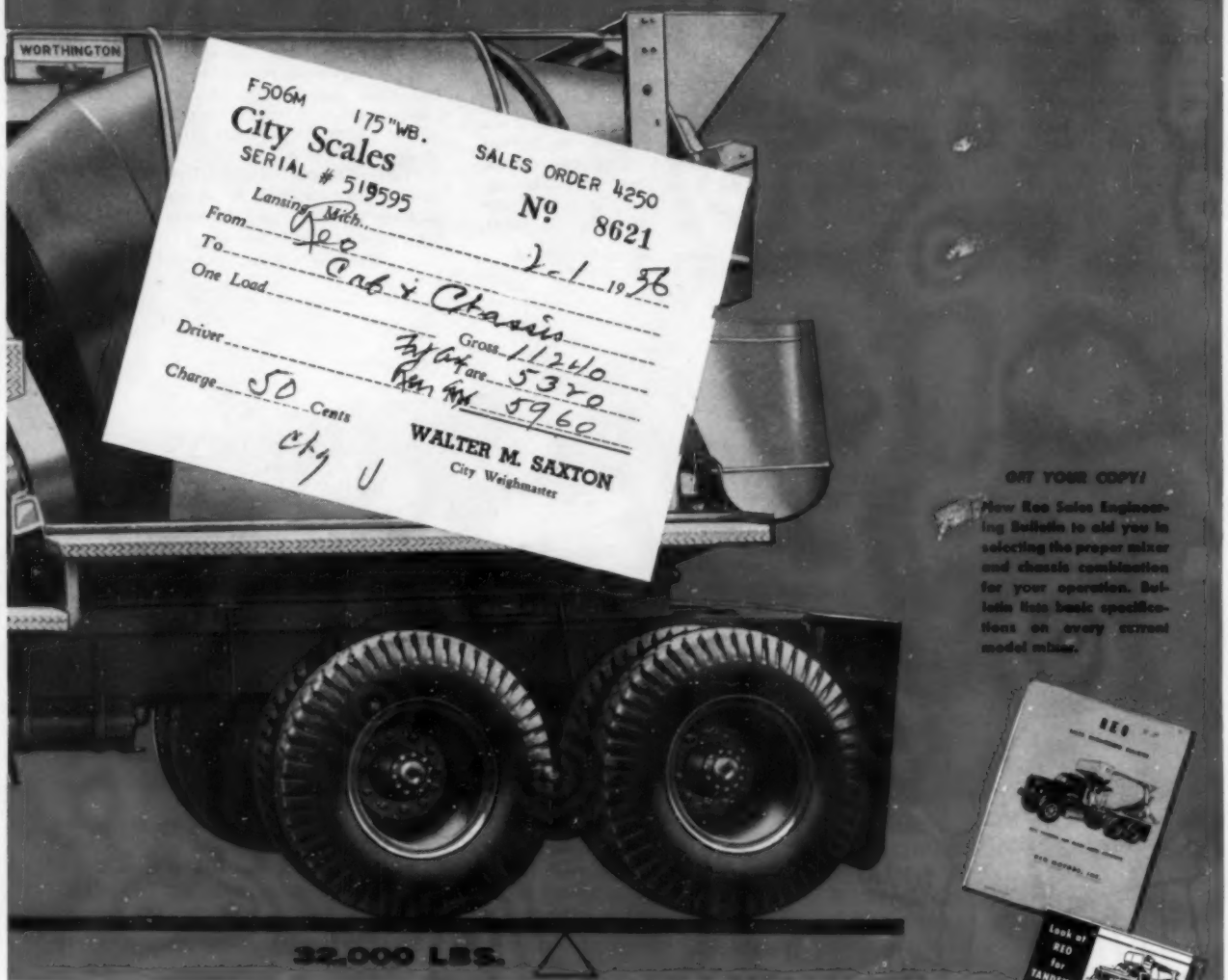
Reo's exclusive *front-axle-payload* design places more weight forward—giving you an extra 2 cubic yards of concrete every trip. With it, you can haul your regular daily volume with fewer trucks and drivers . . . or increase volume without increasing your fleet.

For states that permit greater axle loadings than 32,000 lbs., Reo builds the F-536M—52,000 lbs. G.V.W.

Additional hundreds of pounds can be added to the carrying capacity of the new Reo F-506M with Reo's optional front-end power take-off. The PTO also eliminates extra fuel and maintenance costs of the mixer's auxiliary power unit.

Call your Reo branch or distributor today and get the facts on the Reo that's right for you. Mail the coupon for full information.

32,000 lb. TANDEM LIMIT



GET YOUR COPY!

New Reo Sales Engineering Bulletin to aid you in selecting the proper mixer and chassis combination for your operation. Bulletin lists basic specifications on every current model mixer.

REO

REO MOTORS, INC.
LANSING 20, MICHIGAN
SUBSIDIARY OF BOHN ALUMINUM AND BRASS CORPORATION

Please send at once:

☐ Sales Engineering Bulletin on all Mixer-Reo Tandem combinations.
☐ Complete Specifications on F-506M. ☐ New Tandem Folder.

NAME_____
COMPANY_____
TITLE_____
ADDRESS_____
CITY_____ COUNTY_____ STATE_____

. . . for more details circle 317, page 16

What's New in Equipment and Materials

(Continued from page 16)

Drum Starts, Stops in Transit

A truck mixer with front-of-engine power take-off that can start, stop and reverse the drum while traveling and is operated by finger-touch hydraulic control from inside or outside the cab, has been announced by the Jaeger Machine Co., Columbus 16, Ohio. This feature is made possible by Jaeger's 3-speed hydraulic reversing transmission which provides an automatic, power-actuated cycle of operation. Optional automotive type transmission is also available.

Jaeger Power Take-Off Mixer

The Jaeger on a GMC FW-556 truck has a center of gravity of 67 in., carries a rated payload of 6 cu. yd. of concrete (24,300 lb.) with legal axle loading. Of the 44,565 lb. gvw, 31,445 lb. are on rear axles and 13,120 lb. on front.

For more information circle 107 on Service Coupon Page 16 and mail now

Suction Litter Collectors

Tarrant Manufacturing Co., 24 Jurnel Pl., Saratoga Springs, N. Y., has designed two general types of vacuum cleaners; the "Gutter-Vac" and the "Litter-Getter." These flexible suction units pick up all kinds of trash: newspapers, paper cups and wrappings, tin cans, pop bottles, leaves, etc., from city streets, public parks, parking lots, recreation areas and highway rights-of-way.

The "Gutter-Vac" models for Jeep and pick-up truck mounting are equipped with dust-filtered litter receiving compartments. They are designed mainly for picking up gutter litter found along street curbs.

"Litter-Getters" are trailer-mounted units. One model is designed for picking up litter and blowing it into large truck-mounted boxes. The other

(Continued on page 43)

"Packy" says...

Selinsky did it again

with ROGERS "T" TRAILERS

This 60 ft. tank weighing 32 tons, poised quite a moving problem.

Henry A. Selinsky, Inc., of Canton, Ohio, solved it with planned load distribution and two Rogers T-15D trailers in tandem.

His method overcame the objections of the highway authorities and complied with the regulations. The move from Gussett Boiler Works in Canton, Ohio, to the ultimate installation sight at Barberton, Ohio, was made at speeds up to 30 m.p.h.

You, too, can do it with Rogers Trailers.

Experience Builds 'em ROGERS Performance Sells 'em

ROGERS LOW BED – HEAVY DUTY TRAILERS

ROGERS BROS. CORP. ALBION, PENNA.

Export Office: 50 CHURCH ST., NEW YORK 7, N.Y., U.S.A. Cable Address: Brosites

. . . for more details circle 319, page 16

CARBO-JET: The quick, efficient method to darken concrete

CARBO-JET reduces glare, improves appearance of roads, walks, curbs, center islands, patios, driveways and runways.

CARBO-JET is a specially formulated carbon black, dispersed in liquid form. It is by far the easiest, and most economical way to introduce gray-to-black shades in mortar and plain or air-entrained concrete.

CARBO-JET disperses faster than ordinary cement colors. A uniformly-colored batch takes much less mixing time. There is no streaking, no color variation. Unlike ordinary colors CARBO-JET does not affect the air content of air-entrained concrete.

MANY ADVANTAGES. CARBO-JET cuts down the danger of glare. On highways and roads, traffic markers stand out. The dark color absorbs and holds heat. Ice and snow melt faster and surfaces dry in less time. The appearance of concrete is improved as oil stains are less visible.

Send for the Technical Data on CARBO-JET today.

CARBO-JET

A Product of Sonneborn RESEARCH

Since 1903 manufacturers of quality building products.

L. SONNEBORN SONS, INC.
Building Products Division—Dept. R5
404 Fourth Ave., New York 16, N. Y.

☐ Send information on CARBO-JET—the better way to darken concrete and mortar.

☐ Also send *FREE* copy of your helpful 128 page Building Construction and Maintenance Handbook.

NAME .....

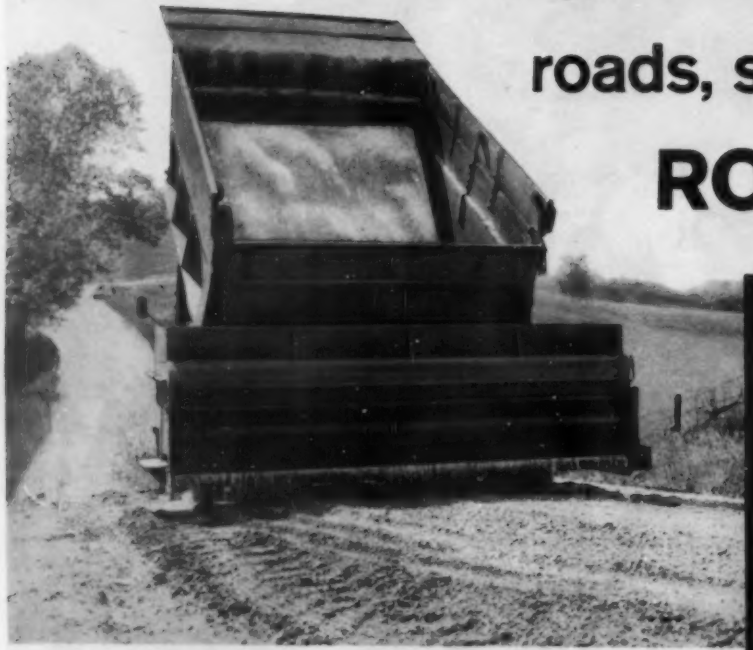
COMPANY .....

ADDRESS .....

CITY ..... **ZONE** ..... **STATE** .....

. . . for more details circle 324, page 16

Here's why 29 states stabilize roads, shoulders with ROCK SALT



In the majority of cases, Sterling Rock Salt is chosen for this modern stabilization work. Sterling Rock Salt—when used for stabilizing base courses, shoulders, and gravel roads—improves road durability and reduces costs in a number of ways.

LOW INITIAL COST. Stabilization with Sterling Rock Salt is quickly accomplished. On most jobs, the salt is simply mixed with aggregate, wetted down, and rolled until the surface is hard and compact. Special equipment is not needed. And labor costs can be kept at a minimum.

GREAT DENSITY, RESISTANCE TO MOISTURE are two important features of salt-stabilized soil. Result: roads resist weathering, cost less to maintain. Also, when Sterling Rock Salt is used to stabilize a gravel wearing course—the surface is hard, long-wearing, almost dustless even in dry weather.

ANTI-FREEZE ACTION. Sterling Rock Salt in stabilized aggregate reduces the freeze point to 25°F. or below. Thus, the occurrence and severity of frost heaving are greatly reduced. And surface breakup is minimized.

SERVICE—With your Sterling Rock Salt Stabilization procedures vary with particular soil and road conditions. For expert advice on stabilization in *your* area, contact International. An International "Salt Specialist" will give you facts and figures on stabilization jobs, on salt storage and handling. He'll work with you on application procedures, costs, specs, etc. And he'll help you fit stabilization into your other road work. Contact the sales office nearest you . . . Atlanta, Ga.; Chicago, Ill.; New Orleans, La.; Baltimore, Md.; Boston, Mass.; Detroit, Mich.; St. Louis, Mo.; Newark, N. J.; Buffalo, N. Y.; New York, N. Y.; Cincinnati, O.; Cleveland, O.; Philadelphia, Pa.; Pittsburgh, Pa.; and Richmond, Va.

STERLING ROCK SALT

PRODUCT OF INTERNATIONAL SALT CO., INC.
SCRANTON, PA.

. . . for more details circle 292, page 16

What's New in Equipment and Materials

(Continued from page 40)

model with its own built-in trash receiver is especially adaptable and used for picking up more widely scattered litter found on highway shoulders and center malls, public parks, and recreation areas.

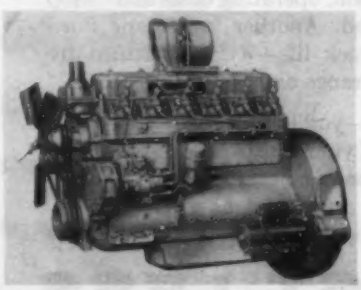
Tarco Litter-Getter

For more information circle 108 on Service Coupon Page 16 and mail now

Supercharged 131 HP Diesel

Waukesha Motor Co., Waukesha, Wis., announces its new model 197-DLCS as a compact and powerful heavy-duty, 6-cylinder, 4-cycle, full diesel engine of 302 cu. in. displacement, burning any standard "high-speed diesel fuel" of 45-octane value or better, and generating 131 hp at 2800 rpm without an intercooler.

The exhaust turbocharger system affords an increase in horsepower with a minimum of parasite load. Other advantages of the turbocharger are a relatively light and compact installation, flexibility in mounting, and the elimination of mufflers on most applications smoothing out the exhaust impulses of the turbocharger.



Waukesha 197-DLCS Diesel

For more information circle 109 on Service Coupon Page 16 and mail now

(Continued from page 48)

OWEN
Engineering scores again
Never before have so many important and improved features been combined in a bucket as in the new OWEN "SCL" wide-type materials handling clamshell bucket . . . redesigned from bowl to head.
OUTSTANDING IS THE 75% TO 100% INCREASE IN CABLE LIFE.
Here's how it's done. The closing line now leads straight through the center plane of the head of the bucket to first lower sheave, thus eliminating bending of the closing line around upper guide sheaves as in conventional block and tackle and lever arm buckets.
Reinforced arms and crosshead afford greater durability without adding weight to bucket. Available in sizes ranging from 3/4 to 3 cubic yards inclusive.
Write today for additional information.
The OWEN BUCKET Co.
BREAKWATER AVENUE, CLEVELAND 2, OHIO
BRANCHES New York • Philadelphia • Chicago
Berkeley, Calif. • Fort Lauderdale, Fla.

. . . for more details circle 315, page 16

The Big Fleets buy

Ford's Tandem Models go modern in a big way! GVW's up to 45,000 lb., GCW's up to 65,000 lb. Wide choice of engines and chassis components permit you to meet your type of hauling conditions.

Why?... Because on-the-job performance and low operating costs prove FORD trucks costs less

Billions of miles of on-the-job experience have proven Ford's dependable performance and low operating costs to the big fleet owners.

Contractors and suppliers, engaged in heavy construction work, have found Ford trucks are best for their fleets, too. To begin with, Ford's initial costs are low. Many models are priced below all competitive makes. For example, the new Ford Tilt Cab models are America's lowest-priced!*

And it costs less to run a Ford truck. Thanks to modern Short Stroke power and sturdy chassis construction, operating costs and "shop time" are reduced. Another important Ford plus is longer truck life—a fact certified by independent insurance experts.

Add it all up—you'll find Ford trucks do cost less! Contact your Ford Dealer . . . let him show you why the big fleets are buying more Ford trucks than any other make.

*Based on comparison of manufacturers' suggested retail delivered prices

FORD TRUCKS COST LESS

LESS TO OWN — LESS TO RUN — LAST LONGER, TOO!

more FORD TRUCKS than any other make!

Ford's Big Jobs are heavy-duty throughout. New, more durable engines. New stronger cabs and chassis. Up to 45,000 lb. GVW, GCW's up to 60,000 lb.

Representative companies in the Construction Industry that have picked Ford trucks for their fleets...

McDOUGAL-HARTMANN CONSTRUCTION CO.
Peoria, Illinois

EDWARD H. MEYER CONSTRUCTION CO.
Neenah, Wisconsin

M. HOEFFKEN COMPANY
Belleville, Illinois

D. B. THORNTON, INCORPORATED
Atlanta, Georgia

S & W CONSTRUCTION COMPANY
Memphis, Tennessee

KAFFIE LUMBER & BULK BARITES, INC.
Corpus Christi, Texas

MYERS & QUIGG INCORPORATED
Washington, D. C.

LATEX CONSTRUCTION CO. OF GEORGIA
Atlanta, Georgia

PARK CONSTRUCTION COMPANY
Minneapolis, Minnesota

J. H. DURRANCE COMPANY
Fort Lauderdale, Florida

BROWN & ROOT, INC.
Houston, Texas

BUILDERS MATERIAL, INC.
Cedar Rapids, Iowa

TEXAS BITULITHIC COMPANY
Dallas, Texas

J. H. POMEROY & CO., INC.
San Francisco, California

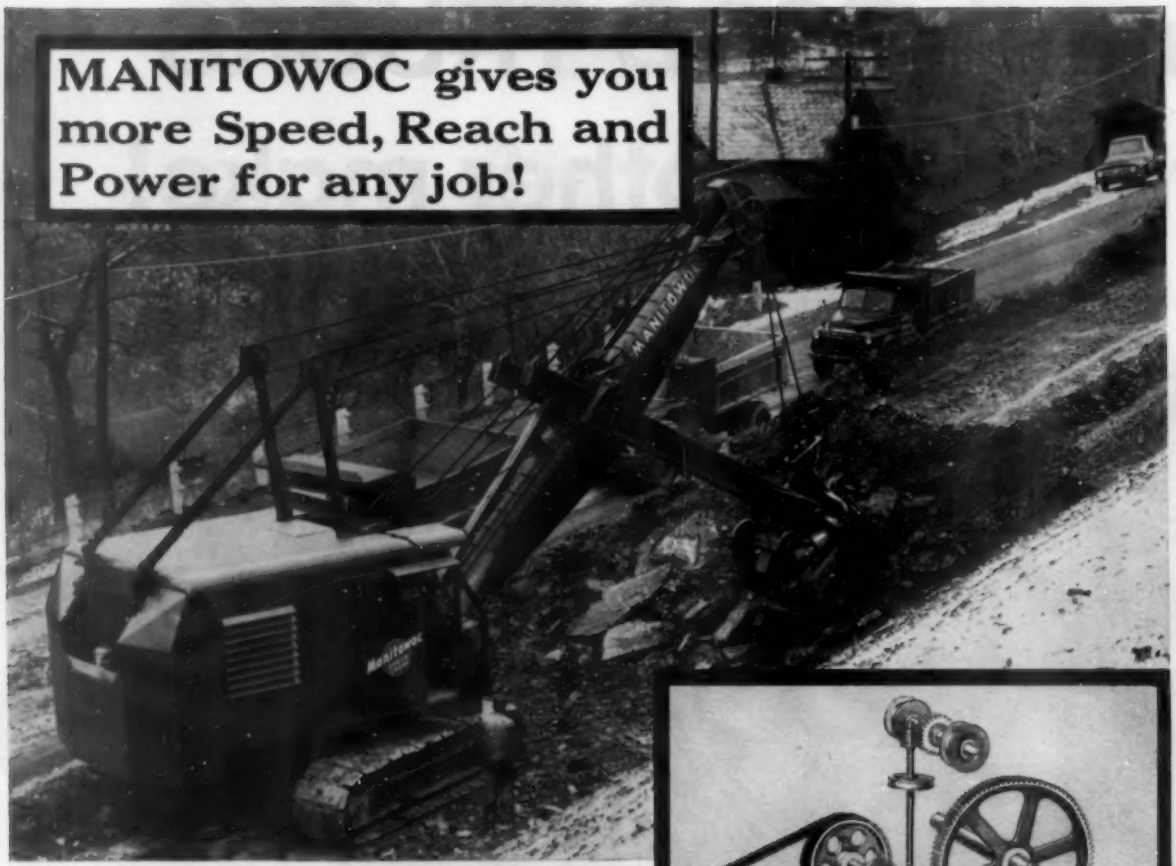
WESTERN CONCRETE
Los Angeles, California

B. O. WILLIAMS CONSTRUCTION CO.
Richmond, Virginia

IMPERIAL PAVING COMPANY
Oklahoma City, Oklahoma

. . . for more details circle 270, page 16

MANITOWOC gives you more Speed, Reach and Power for any job!



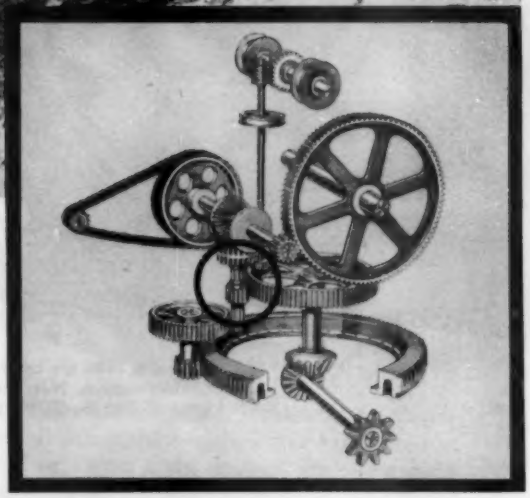
Successful contractors base their bids on a Manitowoc's ability to produce big yardage output — in less time — at lower cost. For instance, R. J. Nichols of New Bethlehem, Pa. uses a Manitowoc 2-yd. Model 3000 shovel to tackle a $1,134,000 highway job for the State of Pennsylvania. The work involves widening a 10 mile, 2-lane highway 4' on each side and eliminating dangerous curves. An estimated 165,000 yards will be excavated before the job is completed. As a long-time user of Manitowoc equipment, Mr. Nichols, like many other prominent contractors, knows he can depend on his shovel to deliver more speed, reach and power to finish the contract on time — at a profit.

More "LOW-BID" Features

Simple Crawler Drive has positive, jaw-type steering — extremely maneuverable in tight quarters. **Completely Enclosed** travel gears and clutches keep going longer with less downtime. **Simple, Accessible Main Machinery** makes full use of power — is easy to get at for convenient servicing. **Dependable, Disc Type Clutches** are easily adjusted, with discs replaceable in minutes. **Smooth-Acting Air Controls** are available to keep your shovel runner at top operating efficiency the entire shift. **Self-Removing Counterweight** is available for fast, simple moves between jobs within highway load restrictions.

Bid more profitable jobs with Manitowoc — check the finest first, then decide!

Manitowoc Engineering Corp., Manitowoc, Wis.



Simple Design . . . Direct Power Flow

EXCLUSIVE SLIDING PINION arrangement (circle) makes use of only one set of clutches for travel, swing and boom hoist. Only working gears turn — all others are disconnected — for full power at the dipper.

ONLY 3 MAIN SHAFTS cross the rotating bed.

FEWER GEARS AND PINIONS — only 17 are needed in the Model 3000.

GREATER ACCESSIBILITY reduces downtime for maintenance and servicing.

SEE YOUR DISTRIBUTOR NOW!

MANITOWOC

SHOVELS 1-5½ YD. Speed Crane CRANES 20-100 TON

. . . for more details circle 305, page 16

Fights Deposits!

Keep out power-robbing deposits in your heavy duty Diesels. Refill with Sinclair SUPER TENOL® for the tough jobs! It helps to eliminate deposits of carbon, varnish and sludge that impair engine efficiency. SUPER TENOL is specially engineered to fight the effects of high temperature, engine over-load and continuous stop-and-go operation. Your engines last longer!

Refill now with Sinclair SUPER TENOL. Contact your local Sinclair Representative or write Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y. *There's no obligation.*

SINCLAIR

SUPER TENOL MOTOR OIL

. . . for more details circle 323, page 16

"WE'RE TURNING OUT THE FINEST MATERIAL IN TEXAS!

. . . Plant Is Operating Beautifully!"

Says Bill Boorhem, Production Manager of Wesco Materials Corp., Dallas, Texas, whose New Circle #1 Plant is their Second to be equipped with EAGLE Washing-Classifying-Dehydrating Equipment!

Yes, when a successful firm like Wesco installs a second round of *Eagle Equipment* at a new plant you can be sure they are right and that the equipment is right.

The Eagle Complete Washing-Classifying-Dehydrating Section at Wesco's Circle #1 Plant consists of a 20' Water Scalping-Classifying Tank with power-operated bleeder valves and triple compartment collecting-blending flume, a 36" dia. x 25' Double Screw Fine Material Washer-Classifier - Dehydrator and a 36" dia. x 25' Single Screw unit, producing concrete sand and mason sand. A 36" dia. x 30' Log Washer processes gravel for specification aggregate. Output averages 2500 yds. per day.

46% of Eagle installations are *re-orders* by satisfied customers. Plan your *first* installation today! Reap the benefit of Eagle's field experience and specialized engineering services.

Send for your copy of Catalog 55

1872 85th anniversary 1957

EXPERIENCE, PROGRESS, SERVICE, SINCE 1872

EAGLE IRON WORKS

140 HOLCOMB AVE., DES MOINES, IOWA

. . . for more details circle 266, page 16

What's New in Equipment and Materials

(Continued from page 43)

Convertible Roller

Model SPR-4 roller is announced by Browning Manufacturing Co., San Antonio, Tex. This roller has pneumatic tires in the rear and a split steel wheel drum in front. A bolster assembly complete with five 7:50 x 15 tires is available as a conversion unit and provides a fully self-propelled pneumatic tired roller when desired.

Browning's SPR-4 Roller

(Continued on page 150)

HELP! HELP!

Articles, Pictures and Comments Invited from Readers

Articles are invited on subjects you feel will help advance the professional knowledge, or give credit to fellow workers in your highway or street department or constructing organization for a job well done—

- "How It was Done"—brief facts on job methods or how problems were solved and work expedited, with pictures and sketches. Examples of equipment application and results—clearing, rock work grading, stabilization, paving, aggregate production, drainage, structures, roadside, etc. etc. etc.
- Engineering developments and examples of practice which you feel qualified to review in connection with your department's program — administration, planning, location, design, specifications, materials, inspection, maintenance, or other.

Articles accepted will be paid for. Typewritten, please. Put it in the form of a letter if you find it easier. Address The Editors, Roads and Streets, 22 West Maple St., Chicago 10, Illinois.

Meet the New
OLIVER OC-46

designed exclusively for loader work

The Jet-Trencher, powered by hydraulic loader system, can be mounted or removed in 90 seconds. This great combination can handle many different jobs.

The new Oliver OC-46 offering 5/8-yd. capacity is available only as a complete loader unit. With wide 46" gauge track and greater track length, it gives you the extra stability to use full power at all times. You can work steadily at top speed with the heaping bucket loads that pile up production faster.

Here's extra mobility, too, with 4-speed transmission ranging from 1½ to 5¼ m.p.h.—a change of pace to meet every need. Maximum drawbar pull is 4200 lb. You'll find it the easiest operating crawler you've ever known with smooth hydraulic controls, velvety clutching, comfortable box-type operator's seat and modern low silhouette that permits maximum visibility. Its years-ahead design means greater earning power for you.

There's still more cost-cutting news for you in the new OC-46. See it and operate it yourself. Call your Oliver Distributor for a demonstration—today!

THE OLIVER CORPORATION

400 W. Madison Street, Chicago 6, Illinois

a complete line of industrial wheel and crawler tractors and matched allied equipment

. . . for more details circle 312, page 16

New A-Line models range from ½-ton Pickups through 33,000 lbs. GVW Six-Wheelers.

NEW ACTION-STYLING! MORE USABLE POWER!

Here is the crowning achievement of fifty years of quality truck production—the great new Golden Anniversary INTERNATIONAL Trucks!

They're *Action-Styled* with fresh, clean functional lines that set a new style pace.

They're powered by new engines that put out more *usable* horsepower—including the most powerful "six" available in its field! They have exclusive new cab mountings for quieter, more level ride. New brakes, new steering, new frames—and many other new features.

The result is a new line of trucks that—more than ever before—are built to cost *least* to own!

See and drive these newest INTERNATIONALS *today!* International Harvester Company, Chicago.

Trucks Unlimited...Powered for Modern Traffic...Plus Modern Comfort

Handsome "Golden Jubilee" Pickup with the *longest* all-steel body in its class. Only Panel with third door. New 8-passenger Travelall® models. New cab-forward models with ideal 89-inch BC dimension. Tractors to 48,000 lbs. GCW. Wide range of all-wheel-drive trucks.

Redesigned engines produce *increased* power without strain from new combustion chamber and valve position . . . more usable power that's "bred for the job". . . at low rpm to keep operating and maintenance costs low. New quick-starting 12-volt ignition.

Biggest windshield—1,181 sq. in.—and *widest* cab in their class! New "Silent-Vent" door wings. New, wider front and rear springs. Exclusive level-riding 5-point cab mounting. Bigger brakes with more lining area, larger cylinders and boosters for quicker, easier stops.

Other INTERNATIONALS, to 96,000 lbs. GVW, round out the world's most complete line.

NEW Golden Anniversary INTERNATIONALS

Cost least to own!

50 YEARS OF TRUCK BUILT
1907 1957
INTERNATIONAL TRUCKS

Motor Trucks • Crawler Tractors • Construction Equipment
McCormick® Farm Equipment and Farmall® Tractors

. . . for more details circle 290, page 16

Strong candidate for
"MOST USEFUL MACHINE"

John L. Bellinger, President of K.E.B. Constr. Co., Inc., North Syracuse, N. Y., sizes up the CAT* D4 Tractor-No. 40 Scraper Unit as follows:

"This is one of the most useful pieces of machinery we own, for we can do so many jobs with it. We clear land, build roads, carry fill and dig cellars, all with this one unit. It has proven its value in our work."

The job pictured here is on a residential housing development near DeWitt, N. Y. The sturdy D4 Tractor has plenty of power to self-load the scraper in clay and hardpan, averaging a heaped 4.5 cu. yd. per load. For land clearing and rough grading the scraper is quickly detached and the No. 4A Bulldozer takes over.

The D4 fills an important place in practically any spread. It's a handy size, small enough to be moved easily from job to job; big enough to give you real production. Teamed up with the No. 40 Scraper on short hauls, its performance often rivals that of larger machines.

. . . for more details circle 255, page 16

The Caterpillar Engine delivers 50 drawbar HP and gives the tractor 10,700 lb. maximum drawbar pull. It's economical on fuel, using No. 2 furnace oil without fouling. The optional oil clutch adds easy shifting, long life and simplified maintenance.

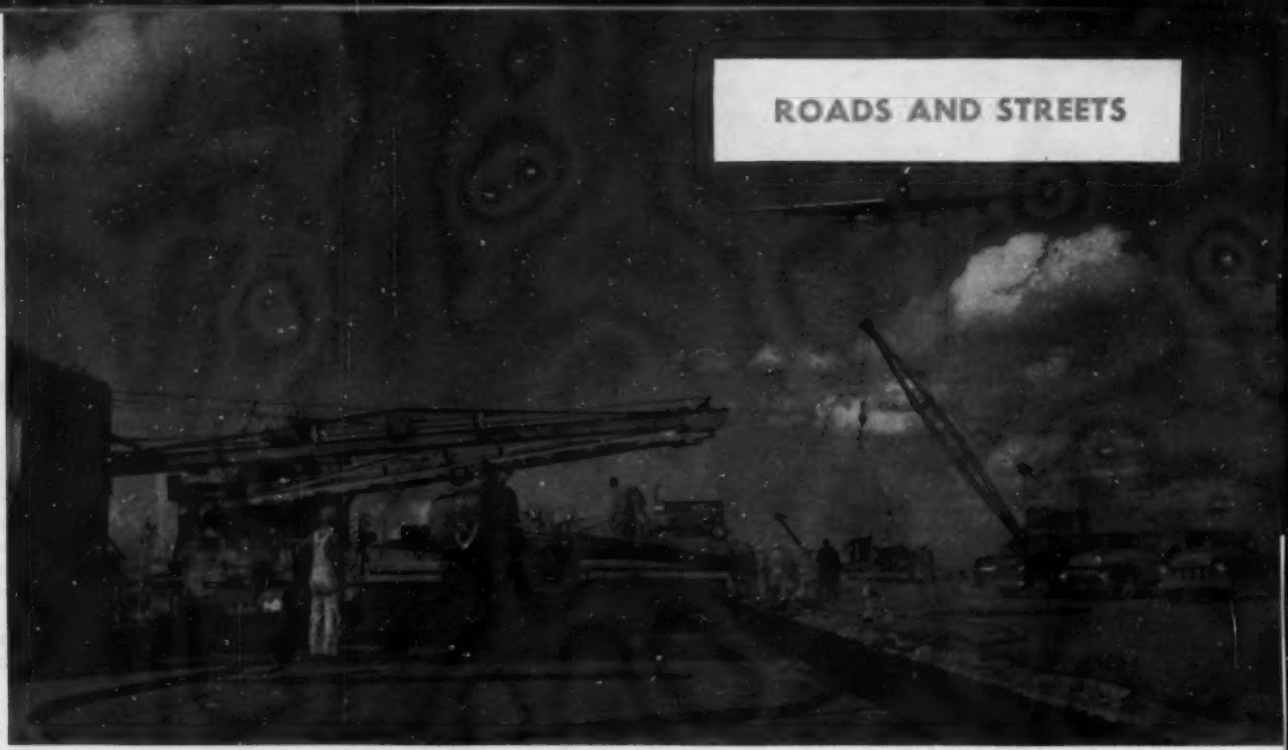
Designed to match the D4 for top efficiency, the No. 40 Scraper loads fast, has quick, positive ejection and is ruggedly built to stay on the job. Your Caterpillar Dealer can show you how these units can make money for you. Ask him for a demonstration on your own job. He backs the long productive life of the machines he sells with reliable service and Caterpillar parts.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

WANTED—
THE HARD WORK



● Pavers on daytime placement, permitted only in cool months. Night concreting favored because of hot, dry winds.

CONCRETE BY NIGHT

ASPHALT BY DAY

Helped M-K Meet Air Base Schedule

With Morrison-Knudsen Company, Inc., at Fairchild Air Force Base, where night-day operations and heavy utilization of subcontractors helped keep job on schedule despite 20 percent work increase.

FIRST OF TWO ARTICLES

How a large and well-equipped contractor met an Air Force deadline despite "project growth" during construction is here related. The contractor is the well known air-base builder, Morrison-Knudsen Company, Inc. The job was the modernization of Fairchild Air Force Base near Spokane, Wash.

Fairchild is one of the Strategic Air Command's busy continental bases. Built during World War II, it has been continually expanded to enable it to handle our largest jet bombers. Morrison-Knudsen moved in during February, 1955, under a contract entailing $4,800,000 in runway extension, pavement thickening, widening, additional apron area and general modernization. While the project grew to about $6 million, M-K was able to hold to the original completion date of September 1, 1956.

The major contract items were: 1,120,000 cu. yd. of excavation; 223,900 sq. yd. removal 6-in. concrete pavement; 53,100 sq. yd. removal old asphalt pavement; 270,000 cu. yd. subbase; 145,000 cu. yd. base course; 104,600 tons asphaltic wearing surface; and 144,500 cu. yd. of concrete.

These items encompassed the widening of all existing runway pavements 50 ft. on each side, ex-

● **Subbase aggregate was mined in deep pit with special attention to blending during shovel loading. Bucyrus-Erie 22-B shovel, Reo truck. Elsewhere a Manitowoc 4-yd. shovel loaded gravel for crushed aggregate into bottom-dump wagons.**

tending the main runway 3,420 ft., providing 1,000 ft. of 16-in. thick concrete pavement on each end of the runway, and replacing existing 6-in. concrete warm-up apron with 16-in. concrete.

In discussing the planning and organization of the project, M-K's project manager, Darwin Lind, repeatedly stressed the important part played by his subcontractors. Lind explained that an air base modernization involves such a variety of skills and experience that it is difficult and impractical to try to incorporate them all within one contractor's organization, however large. Lind stressed the important part he felt that magazine reporting could do in publicizing the availability and specialties of subcontractors.

M-K's subcontractors at Fairchild included:

D & H Paving Co., Vancouver, Wash.; produced asphaltic concrete materials.

Curtis Construction Co., Spokane; produced all aggregates and laid all subbase and base course.

Federal Joint Sealing Co., Spokane; poured all pavement joints.

Valley Construction Co., Seattle; utilities.

Northwest Electric Co., Seattle; all electrical work.

Towmco, Oklahoma City; painting.

Landscape Construction Co., Tacoma, Wash.; seeding.

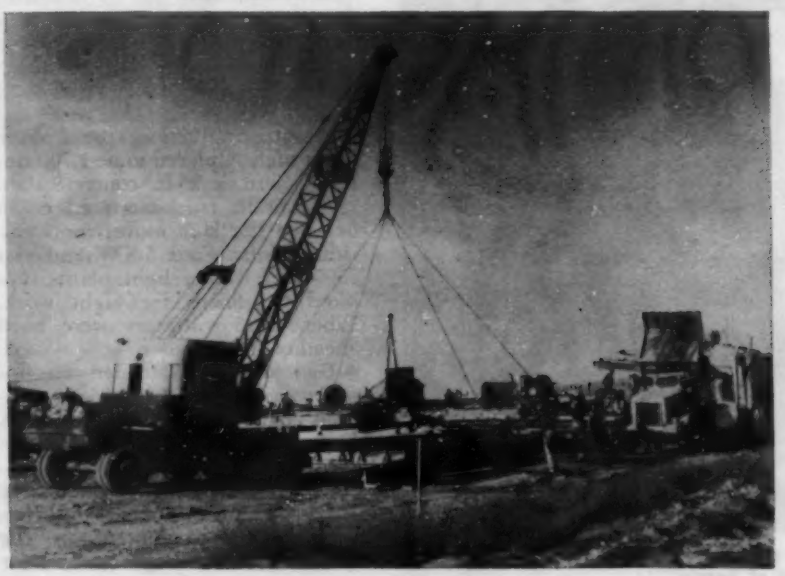
Vietzke Bros., Spokane; batch hauling.

The actual pouring of concrete pavement and placing of asphaltic wearing surface was accomplished by M-K. M-K awarded a joint venture subcontract to Curtis Construction Co., Spokane, and D & H Paving Co. of Vancouver, Wash. These two firms divided their work so that Curtis produced all aggregate while D & H furnished the hot plant mix.

● *Hot, Dry Winds.* The need for keeping the base in operation at all times necessitated close coordination of flight and construction activities. A second major factor in work planning was the intense summer heat with its attendant low humidity and frequent high-velocity winds. The importance given to these quick drying conditions upon concrete pavement resulted in a contract specification requiring that concrete pours could not be made from June through September dur-

● **Fifty acres of old pavement taken up. "Headache" ball with Lorain crane, breaking up old slab for removal by the Northwest 80D shovel.**

● Nearing the end of a daytime lane pour. Most of the concrete was placed at night.



● Lorain crane lifted all finishing and curing equipment on and off forms.

ing the hours from 8 a.m. to 4 p.m. Asphaltic concrete and other activities could be, and were, carried on in the daylight hours.

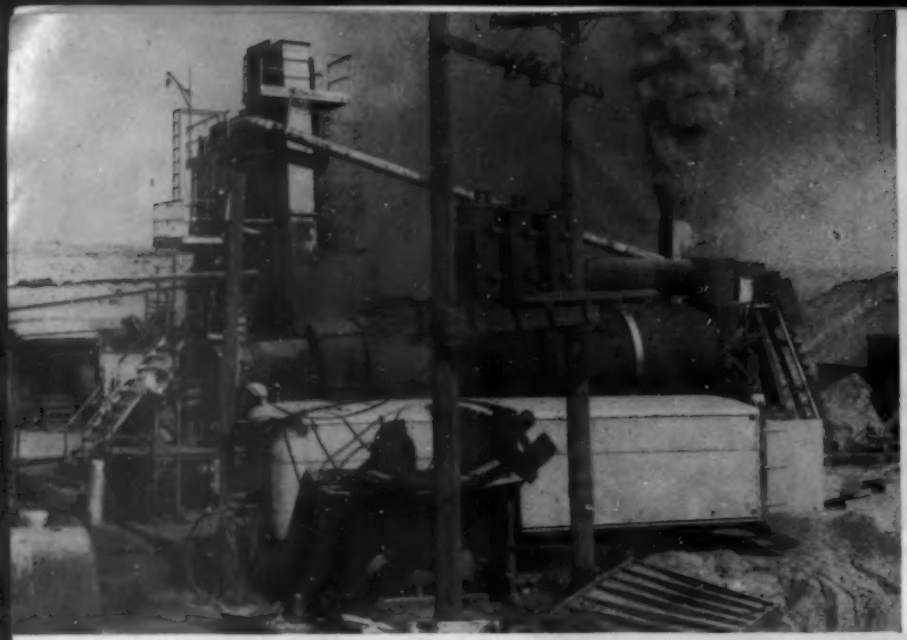
A crane swinging a 3,000-lb. "headache ball" was used to smash the old 6-in. concrete pavement, which was loaded by a shovel into trucks. The fragments together with excavation necessary to provide for thicker slabs were wasted off the air base.

Steel forms were set for alternate lanes on a base which had been graded and compacted slightly above finish grade. When a lane of forms was in place a Buckeye model FG24 finegrader was placed on the forms at one end to grade its way through the lane. This heavy reversible-belt unit with Continental F244 engine moved forward via traction cables fed through two Winsmith 31H speed reducers. The result was an almost floor-like smoothness, to exact grade, which M-K personnel credited with preventing many a headache.

The two pavers worked outside pouring lane, leaving the finegrader undisturbed. Pavers were worked end-to-end, or in any arrangement which best suited positioning of batch trucks.

Placement of concrete in 25-ft. lanes was done with two Rex 34E dual-drum pavers and a conventional finishing train. The latter included the sequence of a Blaw-Knox spreader (model X2), finisher, Koehring longitudinal float (heavy duty), hand bull-float and straight edge, finishing bridge, Heltzel

● M-K personnel shown using old truck tires under Hyster grid roller and Cat D6 tractor, as it was moved across the new asphalt paving.



● **Darwin Lind, M-K's project manager at the job.**

● **Plant of D & H Paving Co., asphaltic concrete paving subcontractors, a 4,000-lb. batch plant adjacent to crusher site.**

● **Buckeye Model FG24 finegrader was credited with simplifying job of accurately shaping subbase ahead of paver.**

belting machine, a second bridge for finishing and pulling joint steel, and a Flexible sealing spray unit. Dowels 1½ x 20-in. were installed at specified locations.

Supported by well-synchronized aggregate production, the 2-paver outfit nightly placed some 1,700 lin. ft. of 10-in. x 25-ft. concrete slab.

A Lorain truck-mounted crane handled the lane moves for form-riding units. Four 5-KW and two 1500-watt Kohler light plants supplied the floods for night work. Viber hand vibrators were used ahead of the spreader.

● *Generator for Spreader.* The installation of a Kohler 35-R81 35-KVA engine generator on the Blaw-Knox spreader came in for an unusual amount of favorable comment by M-K's paving crew. Beside providing power for the Viber electric vibrators mounted on the spreader, it had ample reserve for other power needs.

Engineer personnel gave particular attention to the uniform application of the Servicide membrane curing compound. The specifica-

(Continued on page 208)

● **Supervising the job were, reading across from the left: Ralph Smith, office manager; Henry Meiners, concrete superintendent; Glenn Toy, project engineer; Russell Hopkins, labor superintendent (for Corps of Engineers); Henry C. Bolander, concrete placement inspector; Ralph Smith, project engineer; and Ray Burdett, CE, concrete control supervisor.**

First Cost of a Machine – Or Its Profit-Making Ability?

Contractors as well as government-agency buyers or road machinery will find much food for thought in a booklet put out by Caterpillar. Entitled "Is The Lowest Bid the Best Bid?" the booklet is aimed primarily at the practice of many government officials of purchasing motor graders and other highway maintenance equipment on a first price basis. Some officials are so required by law, and others do so apparently in the belief that low first cost is the gauge of ultimate economy.

Many government officials, notes this bulletin, while they have the responsibility of purchasing heavy construction equipment, do not have the wide experience of contractors who work with this type of machinery every day. It is understandable that many buying bodies revert to low-bid buying of such equipment. Low-bid buying is a natural tendency, furthermore, since quality may be hard to put your finger on, and the dollars-and-cents comparison of bid prices is a tangible thing.

Actually, the booklet reminds, the initial price of machine is nothing more than a down payment on an investment that is for the life of the machine. It is a wise investment to buy the cheapest machine only when the initial saving will not be dissipated by other cost factors.

One paragraph in the statement spells out an axiom of fundamental importance to contractors as well as public-agency owners of equipment. We quote it in full as follows:

"The only true way of taking this intangible quality (of a machine) and developing it into a usable factor that will guide heavy equipment investment is by the use of accurate hourly owning and operating costs over the life of all machinery. These expenditures are continuous and any extravagances, as well as any improvements and savings, occur year after year. The accumulation of these losses or savings is immensely important. A comparison of cost records can be a means of tremendous savings to the taxpayers of your community."

Many public officials who do not have cost records at their disposal have made it a point to visit large road building companies and ask about their job cost records. Such companies are in business for profit, notes the manufacturer, and have their own money at stake. We might add that most contractors agree that the first cost of the machine is a relatively minor consideration in the ultimate unit cost of performing mechanized work. Job efficiency, productivity, and the number of hours of work that can be gotten out of the machine per season are the main considerations.

This fundamental fact has been brought out repeatedly in various articles and editorials in Roads and Streets in recent years. Equipment buyers must be good purchasers and get all that they have coming for each dollar of price. They must also be good cost analysts, which is something else again. Never was it so important to keep accurate costs of the elements going into maintenance and construction operations as it is today in this period of rising prices and evolving methods.

Briefly Noted...

A few months ago we commented on this page that the bridges on expressway facilities should be amply wide, preferably offering no restriction to the full pavement and shoulder width of the roadway. The bridges on the Indiana toll road were cited as examples of less-than-the-best design, since these bridges include only narrow shoulder widths and require guard rails designed as "throats" to warn drivers that a restriction is involved.

Since the road's opening, one accident involving a truck has already occurred near one of the structures. While just an isolated event, this accident should serve as a fresh reminder to all designers laboring on the big Interstate relocation program. They will be playing with the lives of many people if they try to save money by designing structures to less than the highest geometric standards.

•

Force account handling of road construction by the state highway departments in 1956 amounted to only 0.07 percent of the total dollar value of the state projects involving federal aid, but state projects done without federal funds still heavily by-passed the services of the private contractor in some states, according to the annual review just released by the Bureau of Public Roads.

Force account work for jobs done by the state without federal funds last year totalled $36,769,000. While this represents only one dollar in seventeen, on a national average, it constitutes a big chunk of the construction money in some states.

Leading this "spoils" parade is Pennsylvania, where $23,790,000 was spent on 2435 miles of roads by force account in 1956. While this work may have constituted certain operations edging on the classification of maintenance, it still is something for taxpayers of that state to ponder. Are they getting as much for their money as they would out of the competitive private enterprise system? The unit costs for this work would make interesting reading.

•

Does your state have a "watchdog" organization—a really effective group of citizens with no special interest to serve—which can help take steps to see that the highway program is run cleanly?

AGC Convention Told:

"WE'LL NEED MORE CONTRACTORS"

Notes on the 38th annual convention of the Associated General Contractors of America, held March 11-14 in Washington, D. C.

Roads and Streets Staff Review

So much transpires at an AGC convention that reviewing it is like covering a week-long stand of a ten-ring circus. Long before the first general session, the various governing and executive groups and committees have met, the chapter secretaries and managers have sat down together, and the internal machinery of a large association has been oiled and refueled.

This report of necessity can only take a hop, skip and jump. It will do so with particular reference to the highway and airport programs and a few of the general construction industry problems of interest to all.

The AGC continues to grow and expand, noted executive director James D. Marshall in his annual report to the membership. The association gained 181 members during the year, now represents 6,742 firms in its highway, heavy and building divisions who do over 80 percent of the nation's construction in these categories.

• *Highway Division Meeting.* This jam-packed and lively session, presided over by division chairman Edward O. Earl, was an eventful one. A few of the highlights:

1. Federal Highway Administrator B. D. Tallamy spoke at length on the important relationship that the Interstate highway network bears to eventually improving the nation's transportation facilities for business, industry and the traveling public. He carefully outlined the responsibility of the highway construction industry and urged that engineers, material suppliers and contractors cooperate effectively in each segment of the road program.

Four steps which would aid this objective, said Tallamy, are the improving of specifications, eliminating of delays in payment of estimates (through the new electronic computers), advancing of scheduling of projects to allow for better job planning, and contractor-support of states' efforts to improve right-of-way acquisition procedures.

Tallamy revealed himself as a forthright personality by suggesting to this audience—made up of contractors who are chronic sufferers over the intensity of competition—that there should be more contractors. "We are fortunate in having good contractors and I believe we should have more of them," said the administrator. "We'll have small jobs as well as large. This may not be pleasing to you but it will insure more competition, which is good for everybody." *(As noted in staff review in January Roads and Streets, the number of prime contractors participating on the state road programs hasn't increased as fast as the constuction volume in the last few years. Editor)*

• Fred W. Heidenfels, Jr., of Corpus Christi, new chairman of AGC's Highway Contractors division.

In addition to the much publicized Interstate relocation program, which will receive the bulk of the federal highway funds voted for the next 13 years, there will be a doubling of construction volume in the primary, secondary and urban fund categories, reminded Tallamy.

He stressed the benefits that will come to all from the long-ranging aspects of the present program. Heretofore, highway funds have been voted on a year-to-year basis. The present manpower troubles are with us, he said, because we in the industry were unable previously to plan ahead. The immediate need now is to buy right-of-way ahead, so that the actual construction volume can be built up year by year.

In the discussion that followed Tallamy's prepared talk, many points were raised from the floor. One was whether the contractors will have to continue to submit multiple copies of their payrolls, requiring considerable office labor. Tallamy reminded that the 1956 federal highway act does require that contractors certify their payrolls and make them available to

the Bureau. He suggested that contractors keep track of the cost of doing this. "If you can prove this procedure is costly, please give us your figures."

Will there be Bureau specifications for Interstate work, superseding state specifications?—another delegate asked. In replying "no," Tallamy said that the Bureau will, however, through its national experience, be able to help some states exert leadership here.

The audience was given a note of appreciation for the work of John A. Volpe as interim federal highway administrator. Volpe, who is a building contractor and state department of public works leader in Massachusetts, revealed an intimate knowledge of highway problems and procedures when testifying before the recent Senate hearings on the federal program.

● **President-elect of AGC (center), Lester C. Rogers, of Bates & Rogers Construction Corp., Chicago, flanked at the convention by past-presidents Glen W. Maxon (left) of Dayton, Ohio, and Forrest Parrott of Sioux City, Ia.**

● *Highway Division.* The AGC highway division's current activities were reviewed by division manager J. M. Sprouse, who told particularly of the part played by association leaders in testifying before congressional committees on aspects of the expanded highway program. Other points in Sprouse's report:

1. Contractors will benefit by the decentralization of authority announced by the Bureau of Public Roads, which will assure speedier decisions on route location and project approval.

2. Federal-aid highway work continues to be virtually all performed by contract—in 1956, an estimated 99 percent of it.

3. More highway maintenance by contract is in prospect in the various states. This work has shown an increase in recent years.

4. The AASHO-AGC joint cooperative committee continues to flourish, with mutual benefits. It held seven meetings in the past year, under chairmanship of L. N. Ress, Nebraska state engineer, and F. W. Heldenfels, representing AGC.

5. The new revised Bureau specifications for highway and bridge construction, due out this spring, were reviewed by AGC's highway specification task committee which offered suggestions accepted by the Bureau in preparing the final draft.

6. Sprouse's report noted the continued rise of the BPR's Composite Mile index, reflecting rises in wage rates and material costs.

● *Airport Program Lags.* The national civil airport program came in for comment at the highway session, with a report by Mac Harrison, contractor-chairman of the AASHO-AGC joint cooperative committee. The need for more funds to speed construction to serve the expanding commercial air traffic was stressed, and weaknesses in the present legislative machinery pointed out. No present authority exists, for example, whereby funds can be obligated in advance for airport construction projects extending into succeeding fiscal years. Immediate amendment of the Airport act was asked, to permit more orderly advance planning and programming of projects.

● The state highway officials were represented at the AGC highway division session by C. R. McMillan, vice-president of AASHO and chief highway commissioner of South Carolina. He noted the new "spark" in the federal Bureau's management and said that "we in the state highway departments will have to have new 'spark'—more and faster thinking to keep on top of the expanding program." He asked cooperation by contractors to help get more young men into highway engineering and through the initial training stage, to meet the engineer shortage.

The safety program of AGC (reviewed in April Roads and Streets) was discussed from a state-chapter point of view by Ammon Scheur, who told of the excellent progress by the Michigan Road Builders Association. In cooperation with Michigan State University, this group has sponsored safe construction practices which have paid off in prize awards and in a greatly improved safety record.

● *Other Session Notes:* At other sessions during the convention many developments and problems were discussed that bear on the out-

(Continued on page 149)

Lester Rogers Heads AGC for '57

President: Lester C. Rogers, president of Bates & Rogers Construction Corp., highway and heavy construction firm of Chicago.

Vice President: Fred W. Heldenfels, Jr., of Heldenfels Brothers, highway and bridge builders, Corpus Christi, Texas.

Secretary-Treasurer: William Muirhead of Wm. Muirhead Construction Co., Durham, N. C.

Highway Division: Chairman, W. Ray Rogers, Rogers Construction Co., Portland, Ore.; vice chairman, Manley Osgood, Ann Arbor Construction Co., Ann Arbor, Mich.

Heavy Division: Chairman, Robert M. Hoover, Kansas City Bridge Co., Kansas City, Mo.; vice chairman, Charles L. Harney, Charles L. Harney, Inc., San Francisco, Calif.

Building Division: Chairman, Charles B. Solomon, Geo. B. H. Macomber Co., Boston, Mass.; vice chairman, Ira H. Hardin, Ira H. Hardin Co., Atlanta, Ga.

Directors numbering about fifty for the various districts were also installed at the convention.

1200-Ton Slide Cleared From Thruway

During February, the nation's press carried a picture of a spectacular rock slide in a deep cut on the New York Thruway. This slide involving an estimated 1200 tons of granite blocked one side of the highway and contained rock chunks weighing as much as 15 tons. No one was hurt when the slide occurred.

As reported to Roads and Streets by F. William Davidson, acting director of the New York State Thruway Authority, traffic was detoured from the blocked south-bound lanes over to the other roadway, with some traffic allowed through on the inner lane of the roadway affected by the slide. Secondary blasting was used to break up the larger boulders in place, and removal work was begun at once.

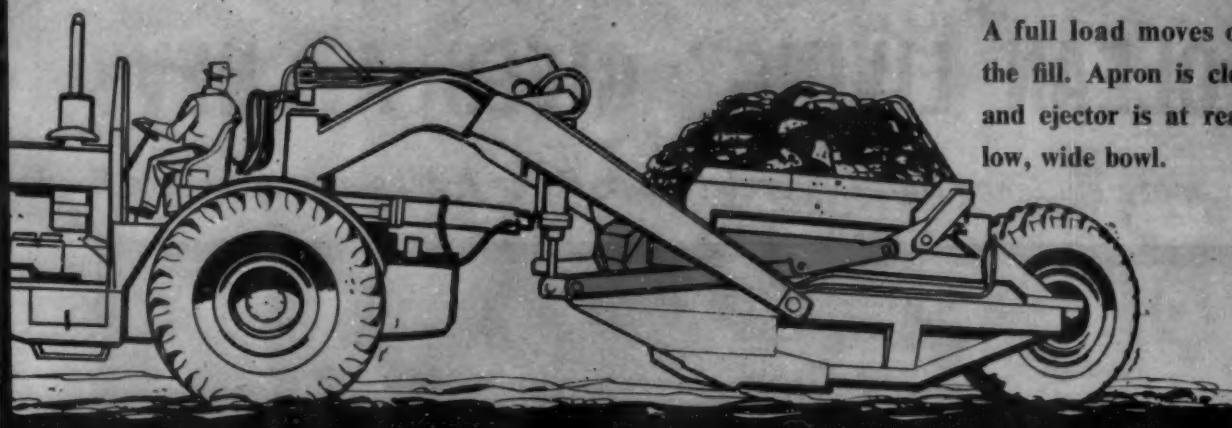
● How the slide appeared as the maintenance crew began cleanup work. Maintenance crews have used their truck to block traffic which might attempt to pass the rock fall. A pole sloping across the roadway in front of the rock pile carries an overhead sign directing southbound drivers to move along the inner lane of the northbound roadway on the opposite side of the median. This arrangement continued until the inner half of the blocked roadway had been cleared, whereupon the cones were moved to the center line of the southbound roadway as shown in the picture below. (Wide-World Photos.)

● The rock fall was attributed to day-night temperature changes in the cliff which brought a sudden loosening of material.

A week's time was taken for the operation which was conducted only in daylight hours on regular working days and even then discontinued whenever traffic got heavy. All traffic was detoured across the mall to the inner lane of the opposite 3-lane roadway during work periods. A ¾-yard mobile shovel and two front-end loaders worked with a motor grader and a fleet of 5-ton dump trucks. Two portable air compressors handled the secondary drilling.

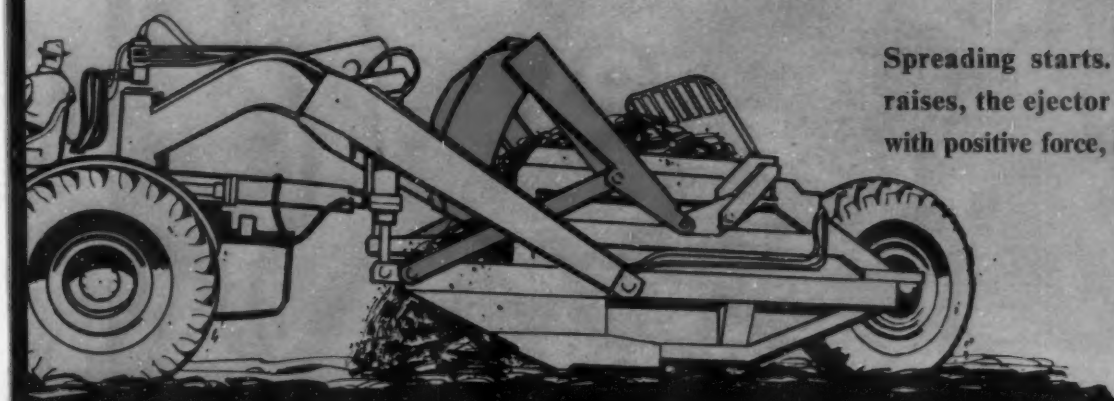
The rock fall area was marked off by traffic cones and portable electric flashers, aided by emergency signs and flagmen where and when necessary.

The regular maintenance force of the thruway in the area performed the removal work under the direction of New York state division engineer William F. Bristow. In charge of the scene was Jacob Sayer, assistant highway maintenance engineer.



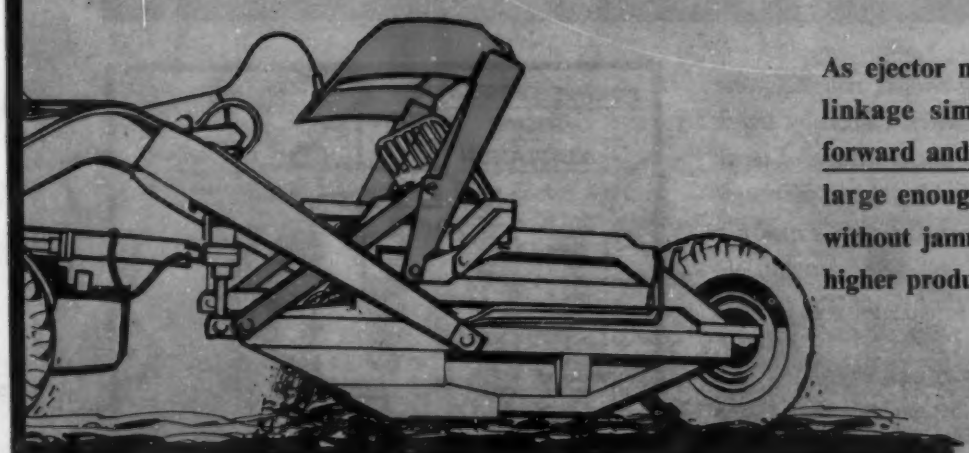
A full load moves on to the fill. Apron is closed, and ejector is at rear of low, wide bowl.

How Allis-Chalmers' patented 3-point scraper linkage



Spreading starts. As the apron raises, the ejector moves forward with positive force, accurate control.

assures fast, clean, controlled spreading of any material



As ejector moves toward cutting edge, linkage simultaneously moves apron forward and upward, providing opening large enough to let any load fall free without jamming. Result: faster cycles, higher production, more profit!

Only your nearby Allis-Chalmers dealer can offer you this important advantage. See it demonstrated now . . . on either motor or pull-type scrapers. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

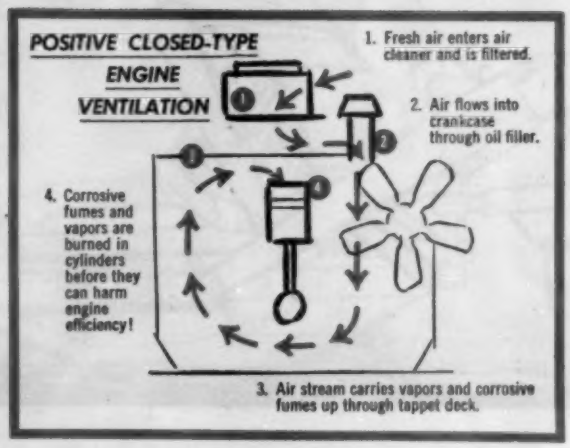
. . . for more details circle 239, page 16

ALLIS-CHALMERS *Engineering in Action*

"CLEAN LIVING" GIVES A CHEVY

. . . more evidence that Chevrolet Task-Force trucks are engineered

This drawing shows, roughly, one of the ways in which Chevrolet truck engines minimize a major cause of wear —dirt! Now consider this additional evidence that Chevy heavy-duty V8's and 6's "live clean" and bring you fleet, dependable power that costs less to use!


POSITIVE CLOSED-TYPE
ENGINE
VENTILATION
1. Fresh air enters air cleaner and is filtered.
2. Air flows into crankcase through oil filler.
3. Air stream carries vapors and corrosive fumes up through tappet deck.
4. Corrosive fumes and vapors are burned in cylinders before they can harm engine efficiency!

EXTRA FILTERS GIVE EXTRA-CLEAN FUEL

Only *clean* fuel reaches the engine—that's one reason you can depend on a Chevrolet truck! All fuel is filtered twice (once in the fuel tank and again in the carburetor) to keep dirt and water from hampering efficient operation. Chevy V8's provide a *third* filter, at the carburetor, for triple protection!

OIL STAYS CLEAN LONGER, TOO

Chevrolet truck V8's and 261-cu.-in. 6's come equipped with modern high-capacity oil filters (V8 filters are of the Full-Flow type). These engines keep *clean* oil flowing to moving parts; parts wear less and last longer because of it!

EVEN THE AIR IS CLEANER

Dust and foreign matter in the air an engine

ENGINE LONGER LIFE!

better and built better for bigger savings!

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"breathes" can reduce engine life by years. Chevrolet minimizes this wear-producing factor by providing big oil-bath air cleaners as *standard equipment* on all truck engines.

Such "clean living" features add extra measures of dependability and durability to the sound basic engineering that characterizes these modern Chevrolet V8's and 6's. Chevy V8's, for instance, give you *shorter piston stroke* than any other truck V8's. Shorter stroke is a sure indication of the kind of engine efficiency that keeps your operating and maintenance costs *down*.

And the valve-in-head 6's found in Chevrolet trucks are so rock-rugged and easy on the pocketbook that they have become, far and away, the world's most popular truck engines. No other truck 6's give you so much low-cost power!

These are sound under-the-hood reasons why a Chevrolet truck will *stay* on your job and *save* on your job. There are others, too—including most every up-to-the-minute engine feature known—and you'll learn about them when you visit your Chevrolet dealer. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

Biggest sellers . . . because they're biggest savers!

CHEVROLET TASK·FORCE 57 TRUCKS

. . . for more details circle 273, page 16

Highway Estimating Methods

By Geo. E. Deatherage, P. E.
Construction Consultant

Mr. Deatherage, author of this series o nhighway cost-keeping, has developed an 8-volume "Manual of Advanced Construction Management" for readers who are interested in more details of cost-keeping and the many related subjects in highway contracting business management. Please address your inquiry to George E. Deatherage and Son, P. O. Box 921, Lake Worth, Fla. Many contractors are finding this manual useful in a training course for superintendents and project managers. It is written primarily for these supervisory employees as an aid in better equipping them for taking on larger responsibilities and improvng their management techniques.

Application of Industrial Engineering Techniques—VI

(Conclusion of Series)

Labor and Material Gang Charts

Five previous articles have been presented, devoted to the adaption of industrial engineering techniques to construction, insofar as it concerns "Methods Pre-Planning." This is the last of the series. Up to the present we have concerned ourselves only with making process chart analysis—or methods pre-planning in which labor alone is taken into consideration. That is, presenting the orthodox industrial engineering techniques used to determine the least amount of labor to do the work. In this process, which has been described in detail, particularly in the February issue, it is pointed out that in pre-determining the most economical method, an analysis is made of the several possible practical methods, these compared, and the cheapest one selected.

It is obvious, of course, in considering alternate methods of doing work, that one method may require more or less material than the other; that increased material costs on one method may more than offset the low labor units. Therefore both labor and materials will need to be considered when comparing alternate methods.

For instance. We have a bridge foundation wing wall to construct in wet ground which necessitates bracing or sheeting. The drawings show a footing upon which the formed wall is constructed. Would it not therefore be cheaper to excavate and brace the trench to neat footing lines and pour it full of concrete to grade? This as opposed to pouring the footing separately, then forming the wall to grade as called for by the plans.

It is quite clear that each proposed method has numerous varying steps in the operation. To follow the drawing we must sheet and brace the hole, which must be wide enough to permit the forms to be set. Then there is blocking out for the bracing and patching. The stripping of the forms, pulling the sheeting, backfilling, etc. Here we have a minimum of concrete, by the addition of the forms, etc.

In the other method we may select a cheap sheeting material which we can leave in place, pouring the concrete directly against it, removing the bracing as we come up. But we use a good deal more concrete and the question is whether this extra cost offsets the form costs, etc.

Editor's Note—

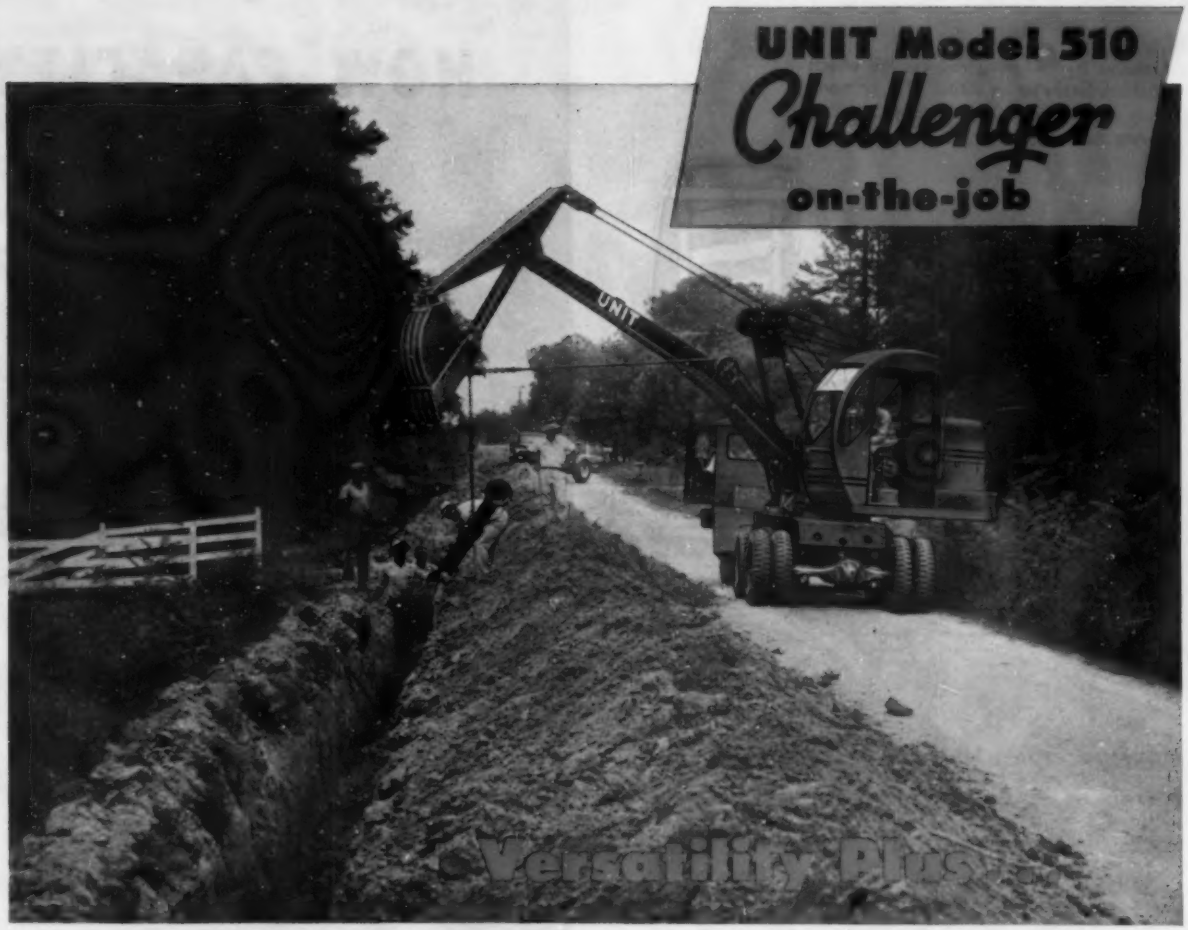
This article concludes the series by Mr. Deatherage. Previous sections were carried in Roads and Streets issues of April, May, June and September of 1956, and February, 1957.

• *Use chart.* In making such an analysis we prepare a "Gang Process Chart" and proceed as has been described in detail in the February issue—setting down each step in the process in Col. 19 in the chart presented here—and timing and pricing each of these as far as the labor is concerned. The materials used in the process are then posted opposite each step in col. 20 and the cost of the materials for each step, if any, are posted in col. 24, or the unit material cost may be calculated and posted in col. 23. In any case we may total these costs at the bottom of the sheet to secure the required material cost or unit as a whole.

It is obvious therefore that we have a mechanical process of predetermining the most economical method to use, both the labor and the material being considered. The example we have given is a simple one. It follows that the more complex the problem is and the more factors or variables enter into it, the more value the charting becomes.

It is generally conceded that in

(Continued on page 68)



UNIT 3/8 yd. Trenchoe *"Pinch Hits"* for Crane on a Pipe Lifting Job

On pipe line construction jobs, the UNIT Challenger provides "Double Duty Performance" . . . It trenches . . . picks up pipe strung along the side . . . positions pipe for permanent installation . . . then backfills. UNIT Challenger is ideal because it has a full 360° swing . . . and the FULL VISION CAB gives unmatched visibility *on all sides*. It will pay you to investigate such UNIT features as **One-piece-cast main machinery case . . . Modern transmission design . . . Alloy steels and forgings . . . Involute splines . . . Force feed lubrication . . . Straight-in-line engine mounting . . . Hydraulic actuated clutches . . . Full floating, trunnion mounted taper drums . . . Torque Converter . . . Safety promoting Full Vision Cab** — and many other advanced features. Write for copy of Bulletin C-800.

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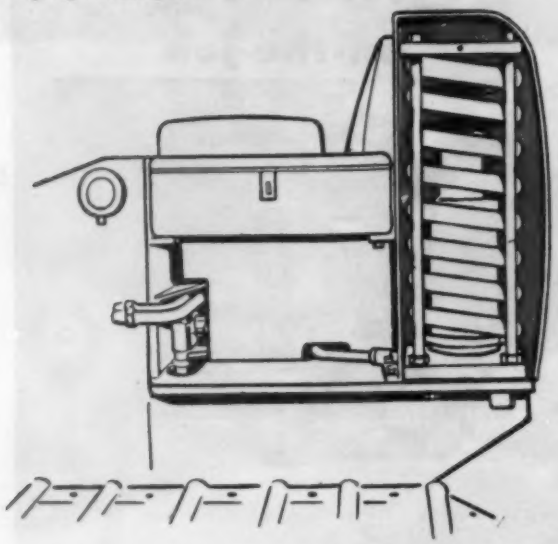
. . . for more details circle 335, page 16

Exclusive Hydro-Spring reduces the effects of shock forces by an actual 67%, or more. Only International Drott gives you Hydro-Spring advantages.



How patented Hydro-Spring increases equipment life and capacity

Exclusive International Drott Hydro-Spring is a hydraulic cylinder enclosed in a heavy-duty *locomotive-type* coil spring. Shock force displaces oil from main lift cylinders into the Hydro-Spring cylinder—extending it and compressing the big spring to absorb and cushion impact loads.

Owners declare that Hydro-Spring adds a whopping 25% to loader and tractor life—besides reducing downtime and boosting production!

Try Hydro-Spring, turned on and off, to prove a vital money-making difference between International Drott and unprotected front-end loaders! Measure the job-getting, yard-adding advantages of exclusive triple-power, pry-action break-out and other International Drott exclusives. And see how you can beat a fleet of limited-duty rigs with an *exclusive* Four-In-One. See your International Drott Construction Equipment Distributor for a demonstration.

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HOW CAPACITY-

. . . shock-

stops hose-bursting,

When you're semi-skidding heavy bucket-loads of material over rough terrain, and the skid-shoes contact a high spot abruptly, linkage isn't pounded—and your spine isn't mauled! *Shock-swallowing Hydro-Spring takes over. No pain—no strain!*

ADDING,

swallowing Hydro-Spring

frame-mauling, spine-smacking impact!

When you solidly set the Skid-Shovel or Four-In-One in tough material to apply famous bucket-heaping, pry-action break-out, you don't punish the equipment, or yourself. *Shock-swallowing Hydro-Spring takes over—intercepts "slam-bang" bumps!*

When you're using the Four-In-One in dozer position and plow into tough material like this hard-frozen soil, you don't overload hose connections with a tooth-jarring crash. *Shock-swallowing Hydro-Spring "gentles" trouble-causing forces by two-thirds, or more.*

. . for more details circle 288, page 16

When you dump a bucketful of rock in one sudden clatter, don't brace for a bump, or expect something to break loose. *Shock-swallowing Hydro-Spring cushions impact, thus cuts time loss, and practically eliminates hydraulic hose failures.*

(Continued from page 64)

highway contracting the oldest and the most successful concerns take the bulk of the business. And that these are carried on by the founders, their descendants or by family interests. Apparently therefore, it seems that success is based on the personal "know-how" of certain individuals.

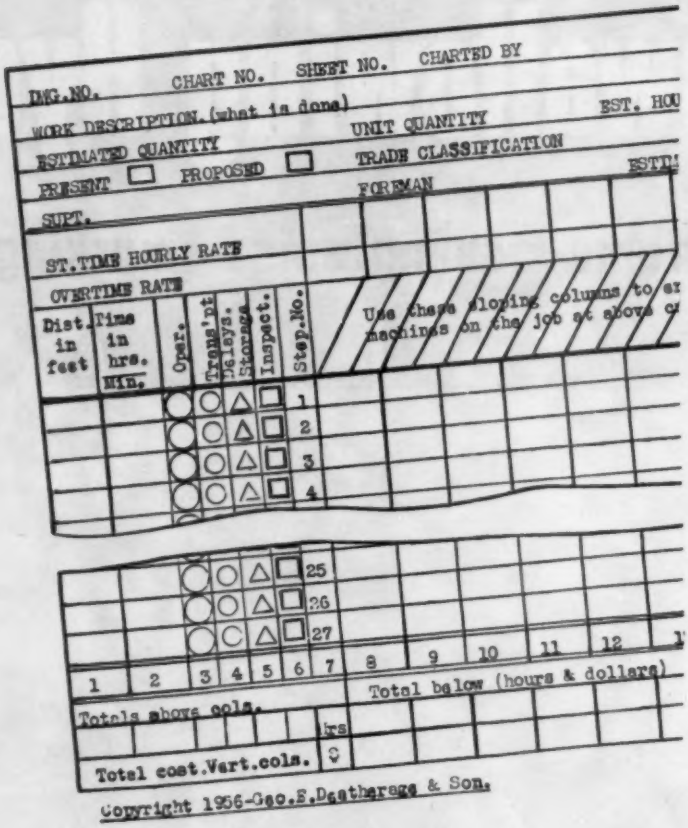
The big point that we have to make in all this adaptation of industrial engineering technique is that road and bridge construction "know-how" is a mechanistic assembly line process that can be learned by anyone sufficiently interested to master and apply it. It usually does not require an engineering education and the principles are so simple that they can be learned in a week or two.

Process charts are the backbone of "methods pre-planning" or "work simplification." When applied they do away with the dependence on personal "know-how" of men who have spent a lifetime successfully in the business. It does away with snap judgments and experienced or educated guesses—because every step of the work, either proposed or as being executed, can be made subject to direct mathematical analysis, and the work either properly planned in the first place or the "bugs" worked out when being executed.

• *New ideas.* Contractors as a whole, however, will be loath to accept such "new-fangled" procedures as they are loath to accept the necessity for keeping unit costs in the field and subjecting them to cost analysis. However, no manufacturing or process industry could survive today without the adaption and use of the industrial engineering techniques of job pre-planning, methods pre-planning, work simplification, standards and methods, time study etc. Contractors must follow suit if they are to survive in a highly competitive market, for it is the only possible way to offset the increasing wage and materials spiral. As labor cannot be driven to increased production, the only other vulnerable point is to outthink them, to pre-plan the work for the most economical work methods and machines.

The "gang process chart" appearing with this article is the same "gang chart" which appeared in the February issue except for the added columns on the right-hand side for entering and considering the materials used on every step of the work. The reader is referred again to Roads and Streets for February, 1957, so that the detailed explanation need not be repeated.

• Gang process chart, including, at right, space for entry of all materials used on job.



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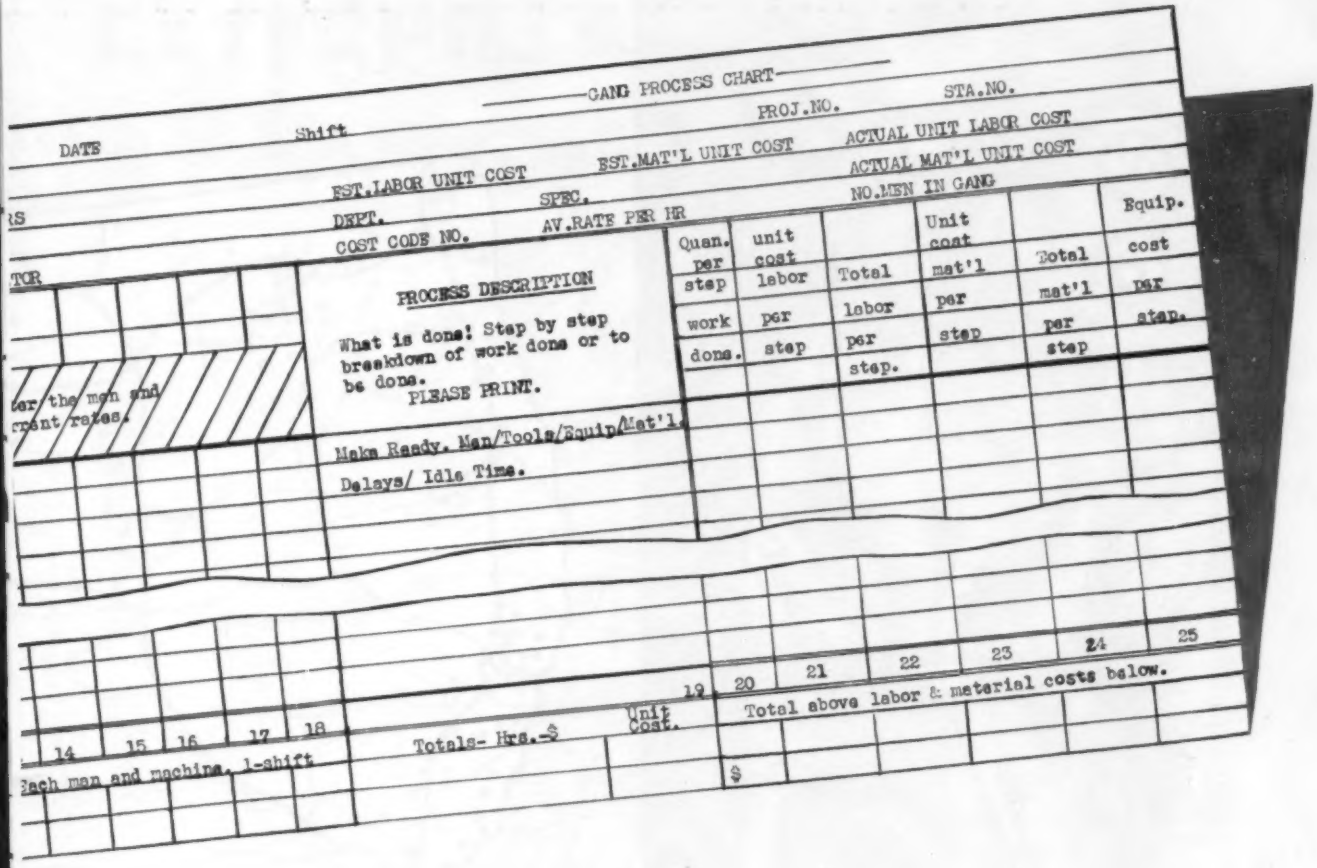
Construction Training Aids as Used in California

With engineers in very short supply, the California division of highways is engaged in an intensified program of training present and new employees to meet the demands of a greatly expanded highway planning and construction schedule. In addition to facing a shortage of personnel with highway training and experience, there are other important training considerations, such as keeping present employees advised of improved practices and procedures affecting their work.

Visual aids play an important part in any modern training program. Many aspects of highway work can be explained clearly and quickly on a group basis only through visual illustration. As early as 1950, this division had settled on color filmstrips, with accompanying disc recordings, as the most suitable medium for a major series of training aids to supplement manuals, plans, specifications, and other available instructional material.

Although the division has used filmstrips in the training programs of the right-of-way department, bridge department and equipment department, in the employee safety program and in several public information presentations, by far the greatest use to date has been in the construction department's training program.

Filmstrips have been produced or scheduled on five general subjects within the construction department's scope:



1. Concrete pavement construction.
2. Asphalt plant operations.
3. Plant-mix surfacing operations.
4. Earthwork operations.
5. Drainage structures.

As an example of the scope of these filmstrips, the major subjects covered by earthwork operations are: purpose, grading diary, working tools, right-of-way staking, clearing staking, centerline staking, slope staking, clearing and grubbing (heavy, medium and light), disposal of debris, cooperation with Forest Service, heavy grading, typical equipment, general soil types, materials report, mass diagram, excavation and slopes, stripping, selected material, benches, underdrains, all excavation, blasting, rough grading, traffic through the work, embankment preparation, recompacting, cross-drainage, drainage structures, concrete boxes, compaction, water, subsidence, borrow pits, stabilization, and erosion control.

Many technical reproduction problems had to be met and solved in the production of the filmstrips. The varying exposures and field conditions under which the pictures were taken required black and white "masking" of the original colored slides to obtain a master and prints within tolerable density limitations. Although the major portion of the photography was performed for some of the filmstrips by the regular photographic staff of the division, much of the 35-mm color photography was done by other headquarters staff or district personnel.

A 35-mm projector with filmstrip attachment and a record player with 33⅓ rpm speed are standard equipment in all of the highway districts. Some additional units are available in headquarters.

● The Fort Pitt tunnel project in downtown Pittsburgh has been awarded to Merritt-Chapman & Scott Corp., New York City, at low bid of $10,764,581. The Pennsylvania department of highways is the constructing agency. The project will be the final connecting link for the Penn-Lincoln parkway east.

Engineer Wanted for Editorial Position

A responsible position open immediately for a civil engineer with journalistic leanings. Prefer man with practical experience in highway department, municipal work or contractor organization. Job involves some travel with camera. Give us your experience record and salary requirements in a brief letter if interested.

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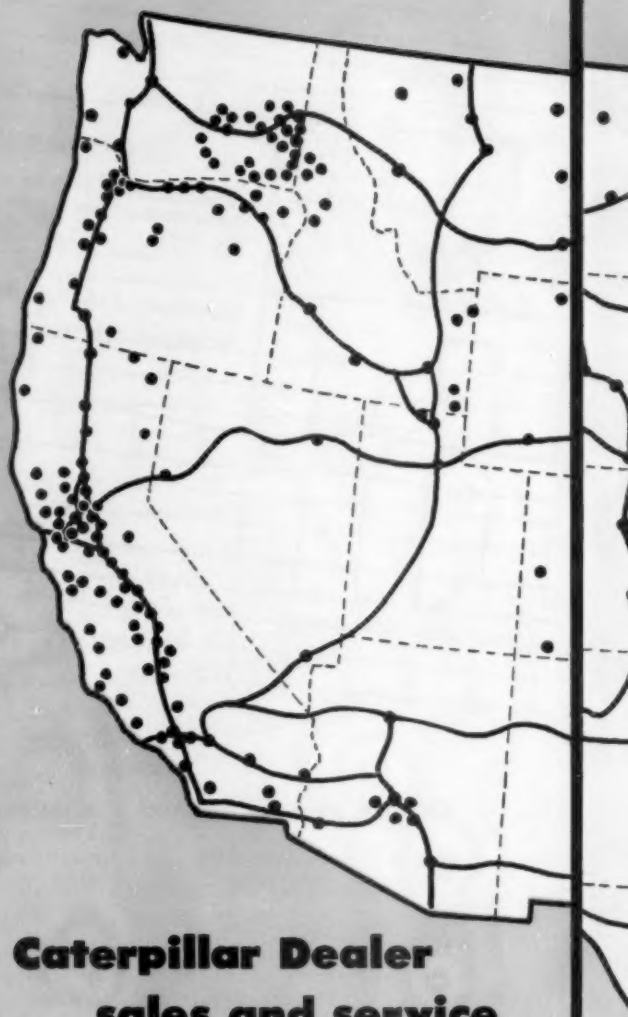

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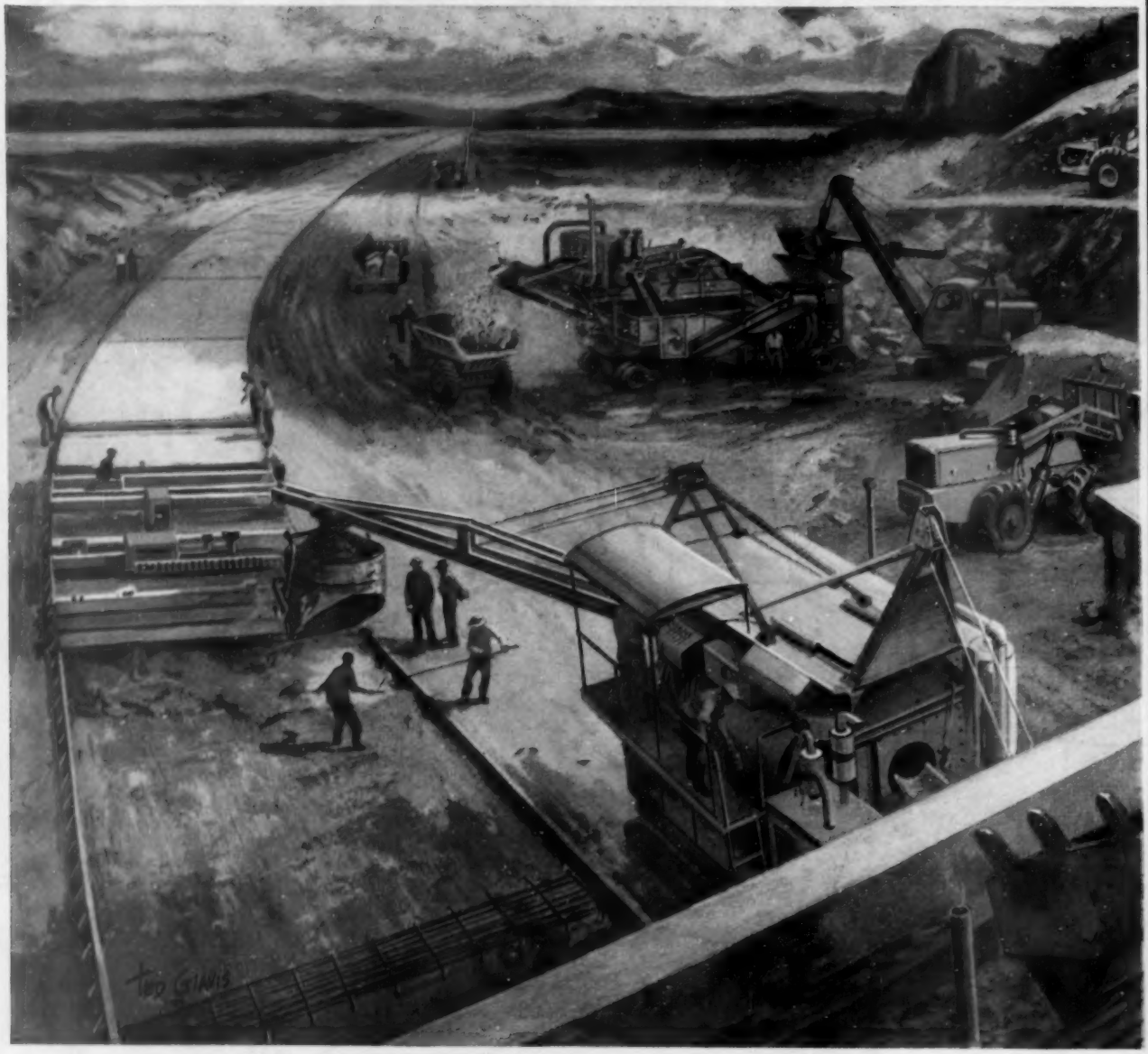

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General Motors Detroit Diesel engines power more different types of road-building equipment—built by more manufacturers—than any other Diesel.

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Leading manufacturers install GM Detroit Diesel power in more than 1000 different machinery applications because it gives their customers unequaled work output and dependability, plus the backing of a world-wide service organization.

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Diesel in Road building ?

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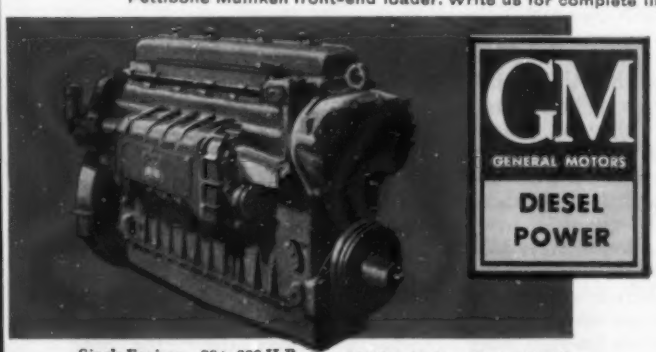

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● Toll plaza areas along the turnpike are bathed in light as a contribution to safety and efficient operation.

● Lighting at the McArthur Interchange on Florida's Sunshine State Parkway. Such lighting in a rural setting is believed to be giving motorists as well as highway officials a foretaste of the more extensive lighting desirable along busier Interstate segments.

Lighting on Florida Turnpike Sets

Choice of commercial supplier of poles, luminaires and other installation products left to contractor. Wide spread between lowest and highest bid for lighting interchanges, terminals and service areas of the 109-mile Florida Sunshine State Parkway.

By C. N. Conner, Highway Engineering Consultant

MODERN high-intensity lighting at all interchanges, terminals and service areas is part of the advanced design standards employed in constructing the 109-mile turnpike in southern Florida. This road extending north from Miami to Ft. Pierce was opened to traffic recently.

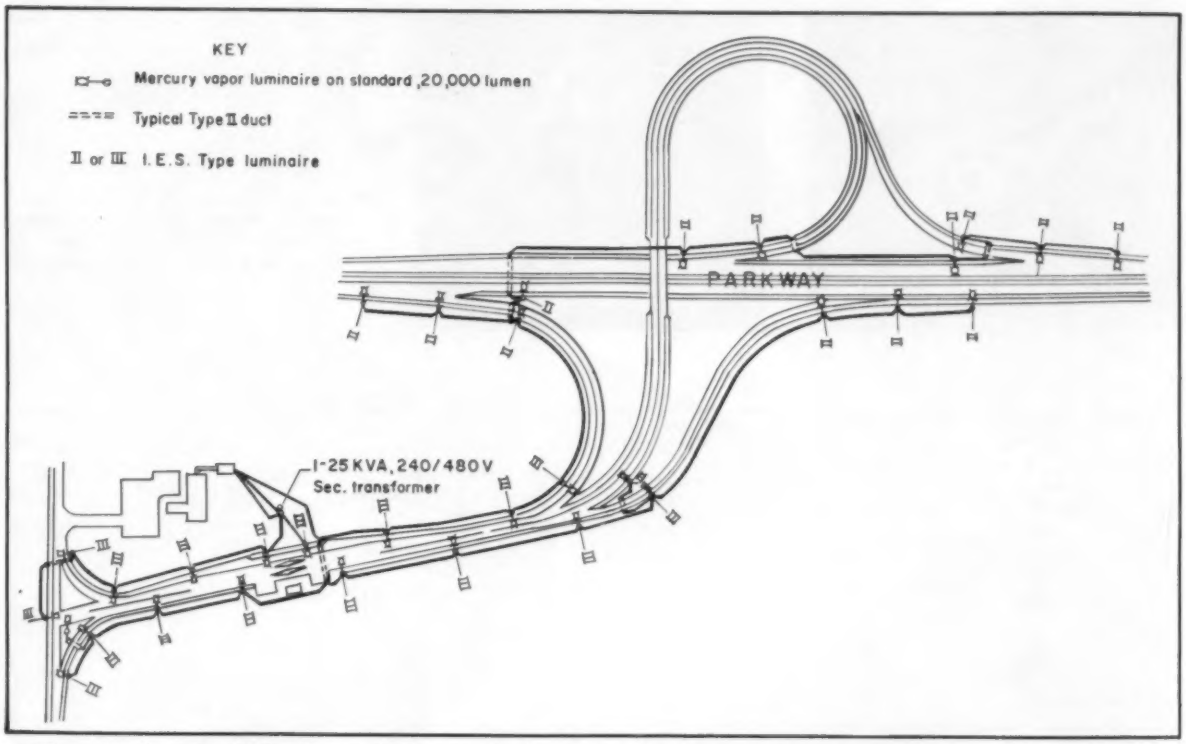
Mercury vapor luminaires for 13 lighted areas were let under a single contract which also included overhead sign supports, floodlighting and traffic control equipment at one area. Mercury vapor luminaires generating 20,000 light lumens each were selected for the bulk of the installation. At the southern terminus, the Golden Glades toll area, 12 units generating 49,000 lumens each were installed. The larger luminaires are color-corrected, fluorescent-type with a slight red tint rather than the bluish effect of the other lights. A total of 517 modern luminaires, all told, will aid in the safe, smooth flow of vehicular traffic at night through the entrance and exit roadways and on through lanes in these areas.

Lighting is installed to serve as a warning indication, but its primary design function is to help improve sight at critical areas where speeds are greatly reduced through narrow entry and exit lanes.

Aluminum standards were selected, having arms about 15 ft. in length for support lights over the roadways. The lights are 30 ft. above the pavement.

About one mile of roadway at each interchange and service area will be lighted. The southern terminus will be lighted for about one mile and the northern end at Ft. Pierce about one-half mile.

For the work itself, the multiple, mercury vapor roadway



● **Figure 1. Layout of lighting circuit, ducts and other details for the McArthur toll plaza and interchange (simplified from plan sheet furnished to contractor). See Figure 4 for wiring diagram.**

Example for Expressway Designers

lighting system for the 13 parkway areas was let under one contract. The work called for comprised roadway lighting, overhead sign supports, flood lighting, and a traffic control system at one area.

Mercury-arc lighting was selected because of its low first cost and subsequent low maintenance cost as well as its generally satisfactory acceptance by motor vehicle drivers. The multiple circuit operating on 440 volts was selected to avoid hazards and other undesirable features of a higher voltage series circuit.

Light intensity at interchanges averages about 4 foot-candles, more than sufficient to read a newspaper. Maximum intensity reaches a peak of 10 foot-candles at toll booths. Minimum intensity is between light poles where it drops to 0.7 foot-candle. Pole heights, their location and spacing, and the luminaires were all selected after a careful study to obtain needed illumination consistent with economy of design and operation.

Illumination is at a minimum as traffic approaches a lighted area, reaches a maximum where tolls are paid and then diminishes as traffic leaves the area. This gradual increase and decrease is considered helpful to driver vision and makes for safe driving.

● *Pole spacing* is approximately 150 ft. and staggered. Poles are planted 10 ft. from edge of pavement at outer edge of shoulder. However experience on other lighted parkways has shown that even 10 ft. may not be enough to prevent occasional careless drivers from hitting them. Although the 15-ft. arm extends only 5 ft. over the 24-ft. pavement, full lighting of pavement is obtained by slanting luminaires at an appropriate angle to spread needed light intensity for full width of pavement.

All electric materials, construction and installation were required to be in accordance with the National Electric Code and to meet the requirements of the utility company supplying the installation.

The lighting installations, when completed, were required to comply with the applicable provisions of the A.I.E.E. Standards and Practices, American Standards, and National Electric Manufacturer's Association Standards, and to conform to all local and special laws or ordinances governing such installation, and to the special requirements as set forth in the detailed specifications.

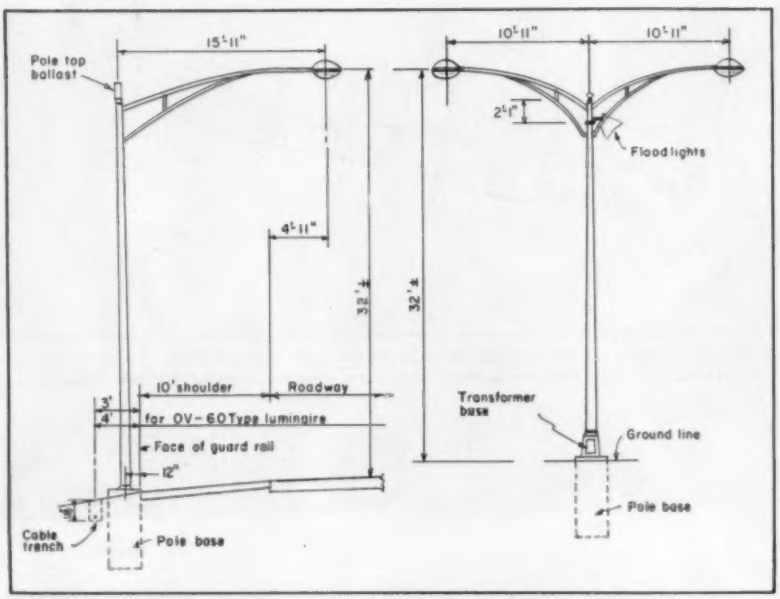
● At left, Thomas B. Manuel, chairman of Florida Turnpike Authority, and Sam P. Turnbull, chief engineer of Florida Turnpike agency.

Unless specifically noted otherwise, all lighting equipment was required to be equal to the best grade of equipment manufactured by General Electric, the Westinghouse Co. or the Line Materials Co., and the standards and brackets were required to equal the best grade of Union Metal, Pfaff and Kendall, Kerrigan or Hubbard.

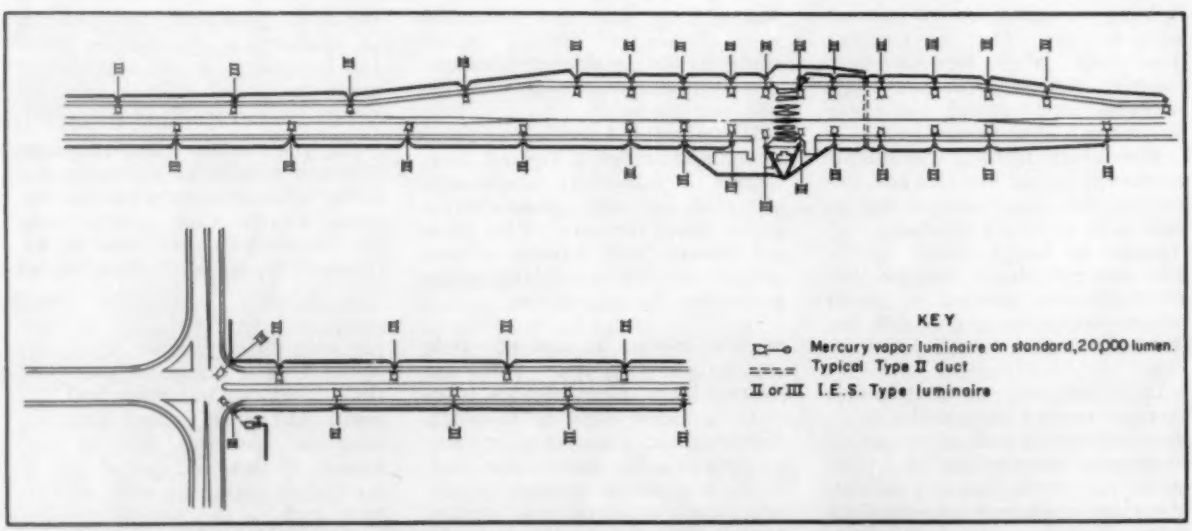
Bids for the roadway lighting were received from seven contractors and were opened on April 27, 1956. Bidders were: John C. Morris Company, Jersey City, N.J.; Whitmore Electric Company, Miami, Fla.; Brooks Allison Company, Atlanta, Ga.; Lowry Electric Company, Inc., Coral Gables, Fla.; Collier Construction Company, Strongville, Ohio; Cleveland Electric Company, Jacksonville, Fla.; O. V. Scott Electric and Fishback and Moore, Inc., Atlanta, Ga.

Award was made to the low bid-

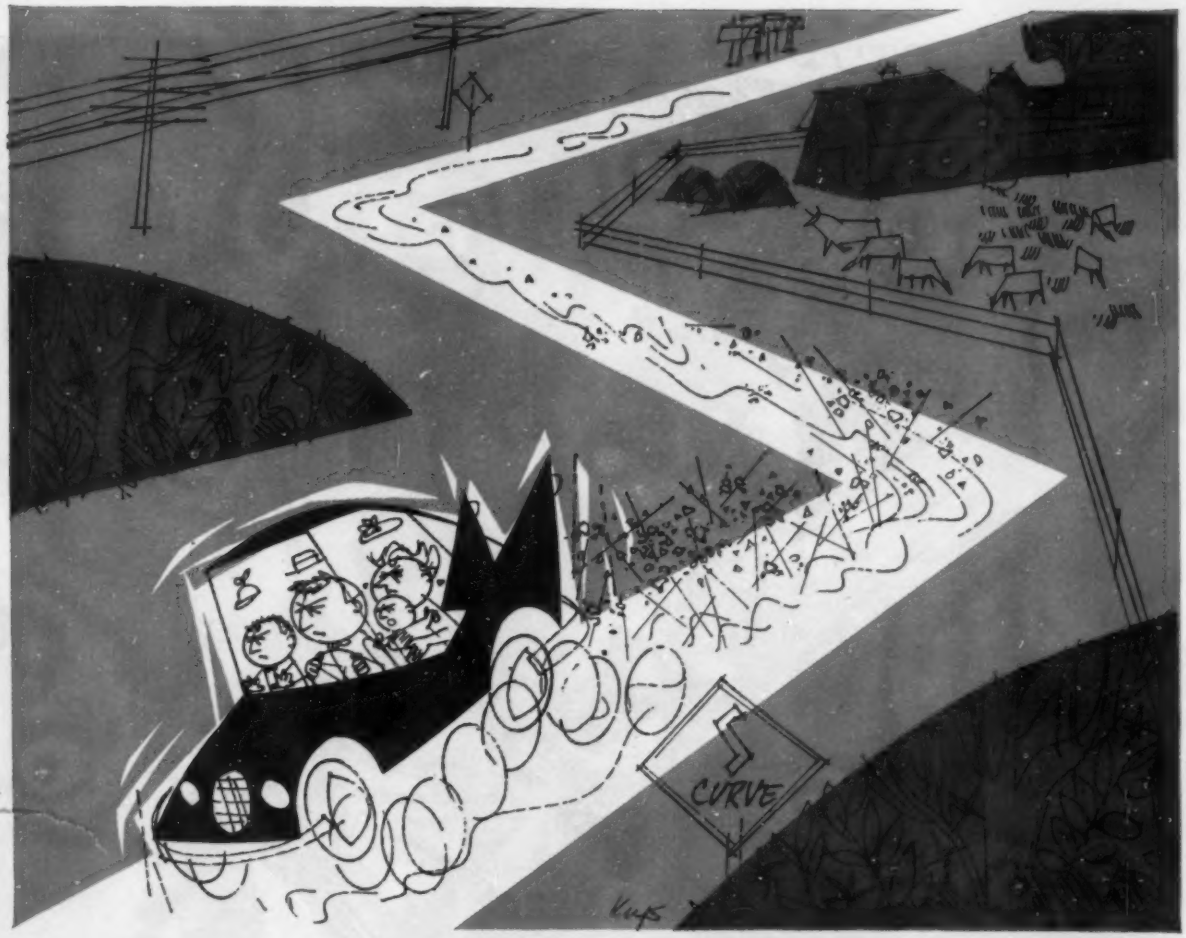
(Continued on page 80)



● Figure 2. Showing type and location of poles and luminaires for two typical locations.



● Figure 3. Circuit and duct diagram (simplified for turnpike's Southern Terminal tool plaza). See Figure 5 for wiring diagram.



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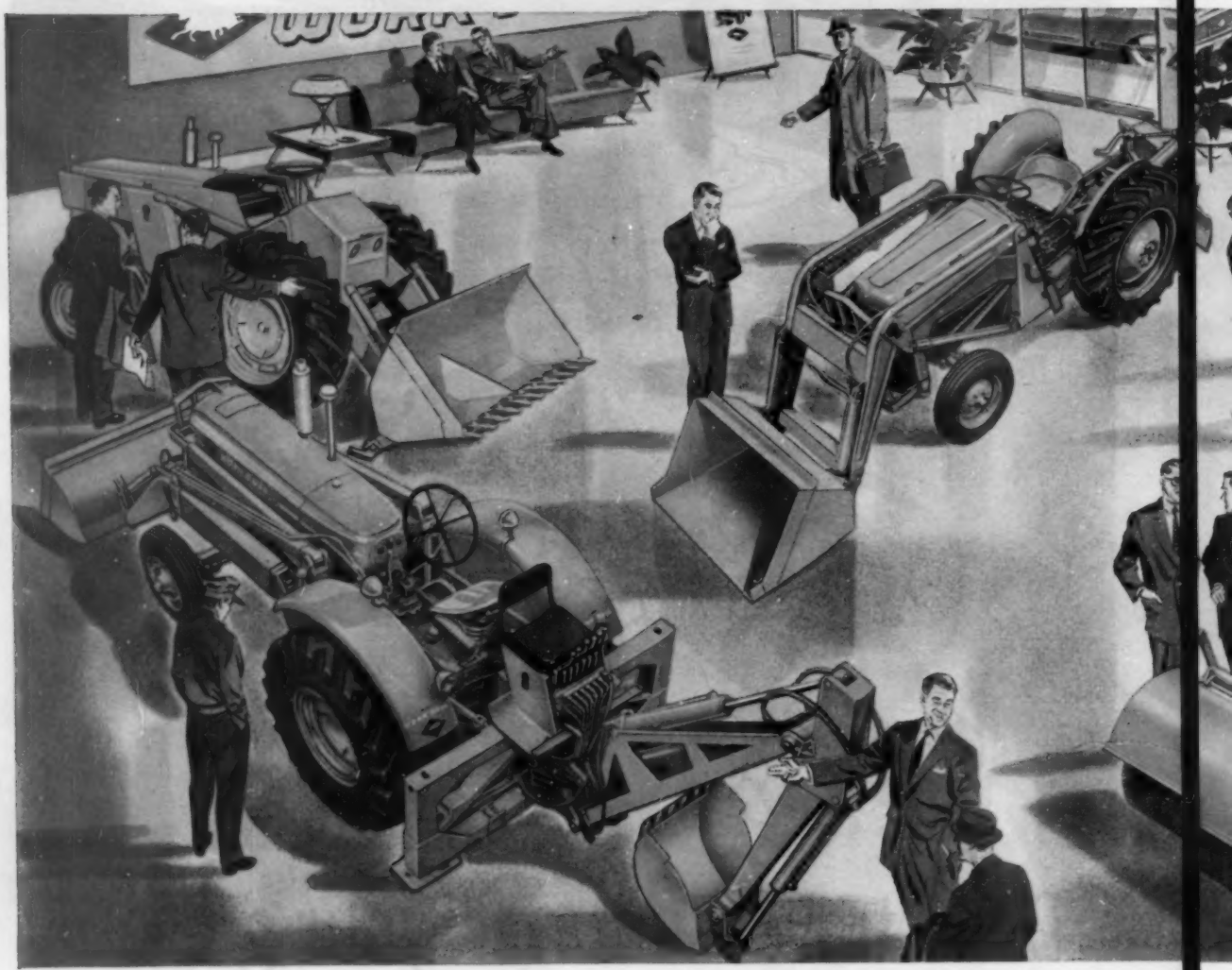

5 tractors, 20 interchangeable attachments--

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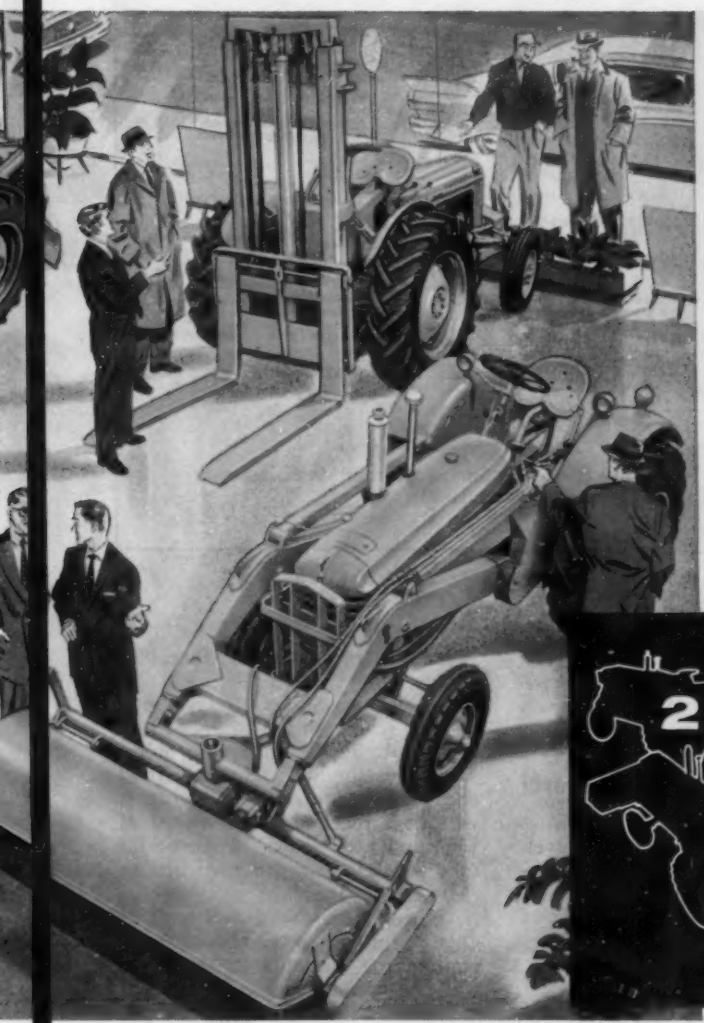

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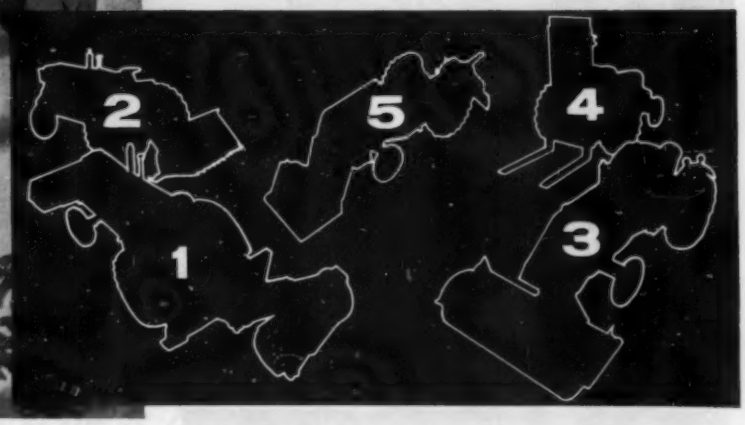
5. **34-hp** Work Bull Model 202 with rear-mounted multi-purpose, adjustable angle blade and . . . Model 102 loader with 11 cu. ft. hydraulic bucket and down-pressure cylinders.



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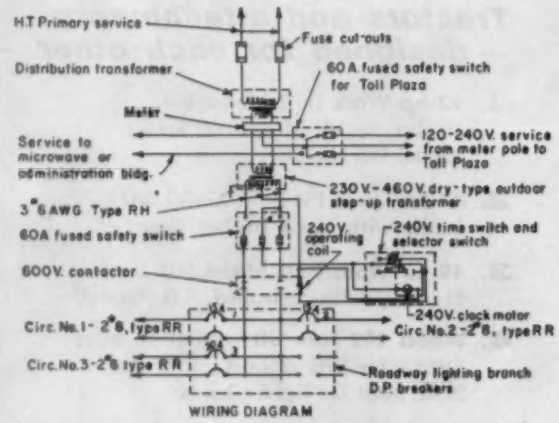
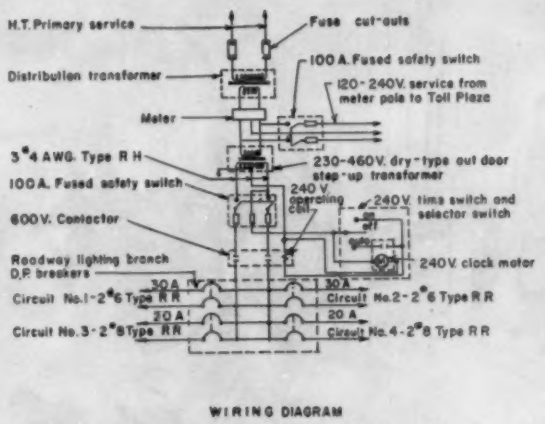

H.T Primary service
Fuse cut-outs
Distribution transformer
60 A fused safety switch for Toll Plaza
Meter
120-240 V. service from meter pole to Toll Plaza
Service to microwave or administration bldg.
230 V.-460 V. dry-type outdoor step-up transformer
3"6 AWG Type RH
60A fused safety switch
240 V. operating coil
240 V. time switch and selector switch
600 V. contactor
240 V. clock motor
Circ. No.1- 2"8, type RR
Circ. No.2 -2"8, type RR
Circ. No.3-2"8 type RR
Roadway lighting branch D.P. breakers

WIRING DIAGRAM

● **Figure 4. Wiring diagram for the McArthur toll plaza and interchange. (See Figure 1).**


H.T. Primary service
Fuse cut-outs
Distribution transformer
100 A. Fused safety switch
120-240 V. service from meter pole to Toll Plaza
Meter
3"4 AWG. Type R H
230-460 V. dry-type out door step-up transformer
100 A. Fused safety switch
240 V. operating coil
240 V. time switch and selector switch
600 V. Contactor
Roadway lighting branch D.P. breakers
240 V. clock motor
30 A
Circuit No.1-2"6 Type R R
Circuit No.2-2"6 Type R R
20 A
Circuit No.3-2"8 Type R R
Circuit No.4-2"8 Type R R

WIRING DIAGRAM

● **Figure 5. Wiring for the Southern Terminal toll plaza. (See Figure 3).**

FLORIDA TURNPIKE LIGHTS

(Continued from page 76)

der, John C. Morris Co., at $341,959. (The highest bid was $636,392.) The installation work was done by Florida Electric Service Co. Alternate bids were asked on both aluminum and steel poles. Even though the bid on aluminum poles was nearly 6 percent higher, the contract was signed for aluminum, largely because of their expected lower cost of maintenance.

Armco Offers Unique "Travel and Learn" Scholarships

Two new experimental travel-and-learn scholarships for civil engineering students have been announced by S. R. Ives, president of Armco Drainage & Metal Products, Inc.

The Armco Summer Civil Engineering scholarship winners will do their studying by on-the-job observation of highway and railroad construction projects. The winners will each receive a cash award of $500 and a six weeks' expense-paid tour of major construction sites.

Ives said that the scholarships have been set up on a trial basis in an attempt to interest more civil engineering students in the highway construction field.

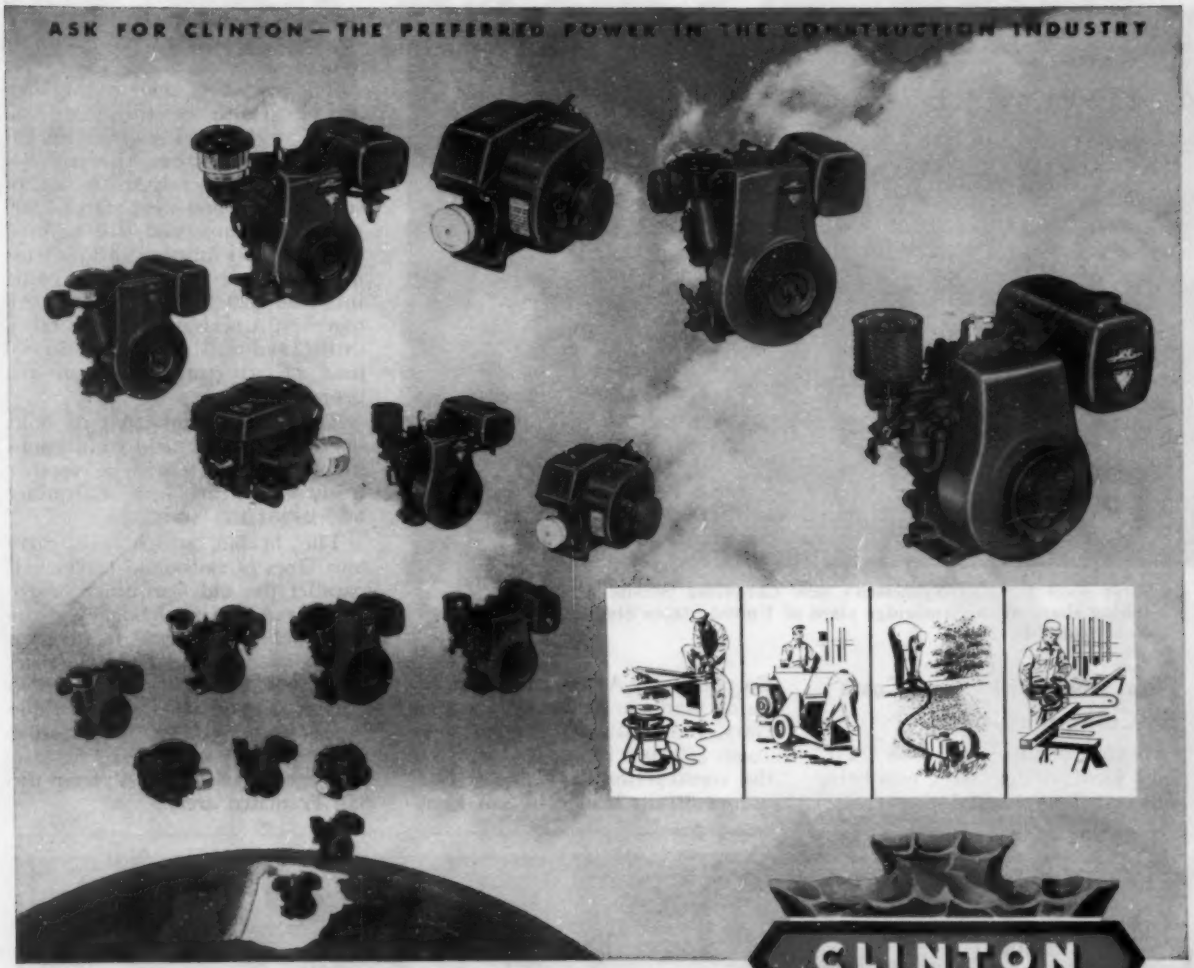
"Heavy construction is a complicated and diverse field," he said, "and there is probably no better way for student engineers to acquire a feeling for heavy construction methods than by visiting such projects in progress."

Colleges participating are Pennsylvania State University, University of California, North Carolina State College, University of Illinois, Iowa State College, University of Kansas, University of Minnesota, Washington State College, University of Colorado and the University of Oklahoma.

One student will be selected from each college on the basis of scholarship, personality, interest in his area of study, and on an engineering report dealing with current problems in highway drainage and construction.

Each of these ten finalists will receive $200 in cash and a trip to Armco Drainage's headquarters at Middletown, Ohio, for personal interviews and final judging.

● **Standards for modern highway lighting have been designed for improved appearance as well as the great structural strength necessary to resist winds.**



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. . . for more details circle 345, page 16

● First steel for San Francisco's new Carquinez Straits bridge is taking shape at the Ambridge plant of United States Steel's American Bridge Division.

New Steel Will Lower Costs on California Bridge

Bridge members of USS "T-1" high yield strength steel, now being fabricated at United States Steel Corporation's American Bridge division plants in Ambridge, Pa., and Gary, Ind., will save the customer about $800,000 in material costs for the construction of the new Carquinez Straits bridge in San Francisco. The customer is the California Department of Public Works.

The saving is due to the high yield strength of the new USS "T-1" steel, which can be welded and is capable of resisting stress of 90,000 psi—or nearly triple that of structural carbon steel. Over 2,900 tons of this material will be used in weldments forming various truss members and gusset plates going into the $20 million bridge. Altogether, American Bridge is fabricating and will erect some 15,000 tons of structural steel on the project.

The use of high-strength bolts for all shop and field connections in place of rivets will be another feature of the new Carquinez bridge.

The bridge, which will carry four lanes of eastbound traffic, will parallel the old Carquinez bridge built by American Bridge 30 years ago, and will match it in span length and general appearance. The structure will provide two 1,100-ft. main spans, two 500-ft. side spans, and a 150-ft. mid-crossing tower to carry one-way traffic eastbound on U. S. Route 40 from the San Francisco area.

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SCOOPMOBILE... and only SCOOPMOBILE... will completely straighten up the bucket at ground level. This means bigger loads each trip... a very vital factor to the contractor moving dirt against high-priced time. Can be towed from job to job. Illustrated: Model H SCOOPMOBILE, 1¼ cu. yd. capacity (S.A.E. rated) with enclosed cab, planetary drive, power steering and many other money-making features. Write today for complete details and name of your dealer.

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143 horsepower, 7-yd. struck capacity, 9 yds. heaped at 1:1, 18.00 x 25 tires standard, 21.00 x 25 optional.

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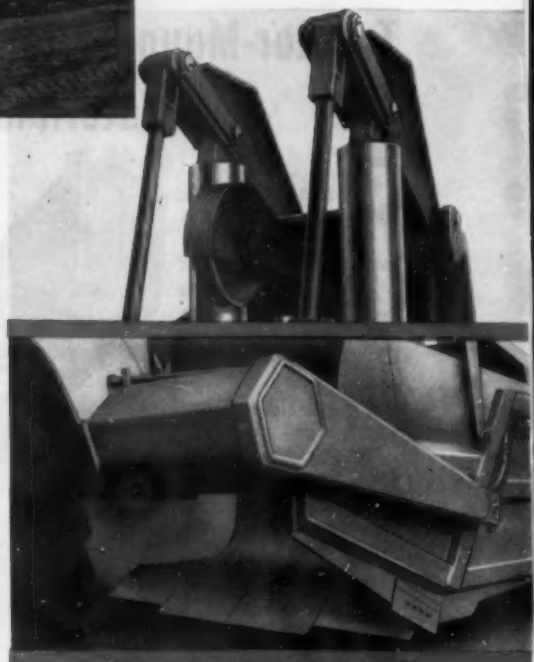
Has only one cable 13 ft. long!

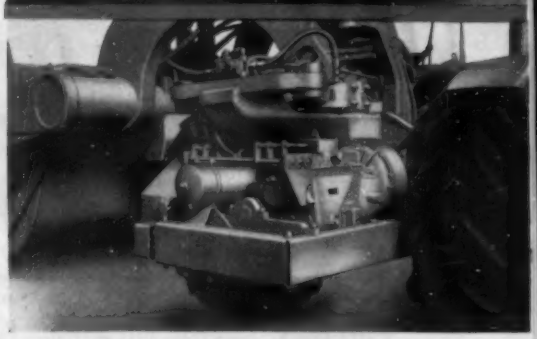


. . . cutting edge has 4 *interchangeable sections!*

Blade sections can be reversed easily for double life and positioned for straight or drop-center cutting edge!

. . . easy *accessibility* of components *cuts downtime!*

Clutch replacement in 1/3 the usual time for scrapers . . . transmission in only 1/8 the time . . . differential in 1/3 the time!



See your Euclid Dealer . . .

Let him show you what these cost-cutting features can mean on your jobs . . . and why owners everywhere have proved that *Euclids are your best investment!*

EUCLID DIVISION, GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

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Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

New Publications

New Booklet on Blasting and Radio Hazard

Recent investigations indicate that the hazard of radio-frequency energy to blasting operations has been greatly exaggerated, according to a report just approved by the Institute of Makers of Explosives. The booklet (pamphlet no. 20) entitled "Radio Frequency Energy—A Potential Hazard in the Use and Transportation of Electric Blasting Caps," replaces an earlier Institute-approved publication on the subject and points out that, "from a practical standpoint, the possibility of a premature explosion due to RF energy is extremely remote."

The nine-page pamphlet explains in simple terms the nature of the hazard and offers precautions designed to minimize it. Two tables of recommended distances are presented for the guidance of persons performing electric blasting operations in the vicinity of fixed or mobile AM and FM transmitters. Since many explosive users—especially contractors—operate mobile FM equipment, it is interesting to note that the minimum distance recommended in the pamphlet for conducting electric blasting operations is only 30 feet from a 250 watt FM transmitter; 5 feet from a 10 watt FM transmitter.

In addition, the booklet also describes in detail how to determine the extent of the RF energy hazard in any area. The potential hazard of such types of RF energy sources as microwave relay, radar and Loran are also analyzed.

The booklet is available without charge from the Explosive Development section, Atlas Powder Co., Wilmington 99, Del.

YOUR OPPORTUNITIES IN INDUSTRY AS A TECHNICIAN. A booklet by this title has been published by the National Association of Manufacturers, 2 East 48th Street, New York 17, N. Y. It is designed to help enlist younger men and put students in technical work, and advises them on the proper procedure to secure training as well as on the opportunities of those who qualify. Free copy on request to the association.

SURVEYING. (2nd edition.) By Charles E. Breed, professor emeritus of civil engineering, Massachusetts Institute of Technology, revised with assistance of Alexander J. Bone, associate professor of highway and airport engineering at MIT. 480 pages. Price $5.50, John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Recommended as a student text and guide.

ESTIMATING PROPORTIONS FOR CONCRETE, (an instruction manual) by Stanton Walker and Delmar L. Bloem, representing the National Sand and Gravel Association and the National Ready Mixed Concrete Association, 1235 E Street, N.W., Washington, D.C.

PRACTICAL APPLICATIONS OF ENGINEERING SOIL MAPS. The results of nine years of research on the engineering characteristics of the soils of New Jersey are summarized in a 113-page volume published by the Rutgers University Press, New Brunswick, N. J. Copy available on request.

The book explains that engineering soil maps can be used in laying out and designing highways, in

(Continued on page 86)

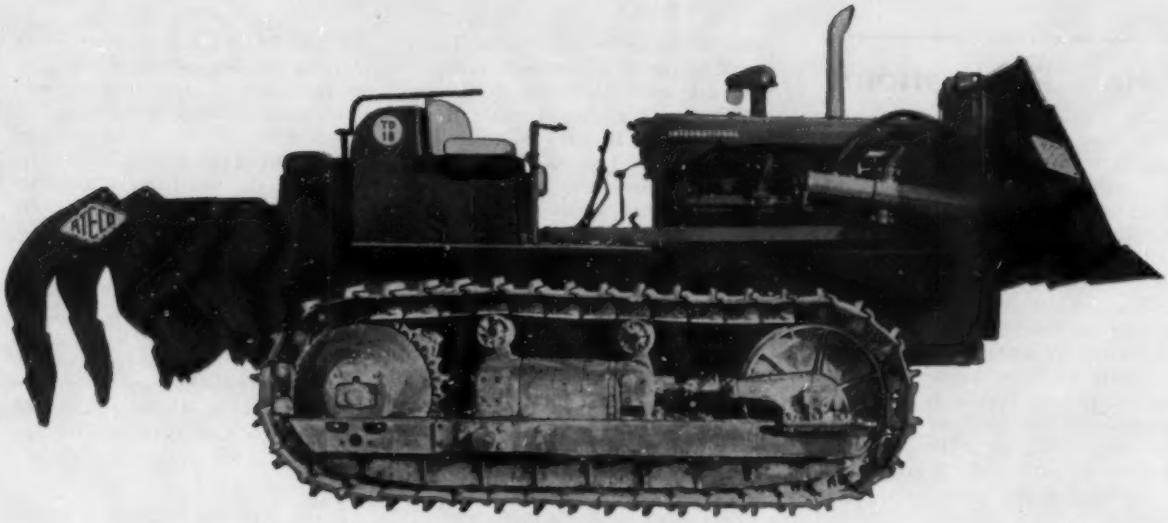
Tractor-Mounted Heavy Duty Loaders for Materials Handling

1 Lifts over 2,000 lb. to full height in less than 7 sec.
2 Built-for-strength tubular steel frame also acts as hydraulic oil reservoir.
3 Trunnion mounted bucket rams won't spring—EVER!
4 Easy access for operator adds to working speed. Full safety protection, too.
A point of SUPERIORity
New pivot position in low-silhouette design gives the Superior loader a 10 ft. 10 in. lift. At the same time the reach—the distance from the front of the loader frame to the edge of the dumped bucket—is a generous 2 ft. 8 in.
SUPERIOR

Extra-quick Superior lift action, with front-mounted Vickers pump. Massive (8,900 lb.) pry-out strength for handling heavy or frozen materials. ▯-section steel loader arms for rigid strength. Hydraulic piping inclosed in arms for protection. Bucket capacities up to ½ cu. yd. Crane booms, snow-coal and specialty buckets available. Superior loaders can do a variety of materials-handling jobs around your plant, and release more costly equipment for specialized use. Fits most industrial tractors. Write for full performance details.

SUPERIOR EQUIPMENT DIVISION, P.O. Box 341, Wheeling 7, Ill.

. . . for more details circle 328, page 16



MATCHED GREENVILLE EQUIPMENT FOR INTERNATIONAL TD-14 AND TD-18

Matched Greenville attachments make an IH TD-14 or TD-18 one of the contractor's most versatile tools. With an inside-mounted 'dozer in front and a ripper in back, operators rip one pass and 'doze their way back. Weight is evenly distributed . . . increases traction . . . more bite . . . puts full tractor power to use.

Greenville ATECO rock rippers for IH TD-14, TD-18, or TD-24. TD-18 and TD-24 rip as deep as 24", TD-14 to 18"; tractor-mounted; completely hydraulic.

7' 11¾" blade tilts in either direction; no nose diving; dual plate design bowl; extra-heavy push arms; no highway permit required.

INSIDE-MOUNTED 'DOZERS—These 7' 11¾" blades take full advantage of the added horsepower in International Harvester's powerful TD-14 and TD-18 crawler tractors. Push arms, mounted between the tracks, use IH's modern hydraulic system and cylinders to provide trouble-free hydraulic power. Center of draft is always between the tracks. Nose diving is eliminated. You dig and roll big loads with less clutch fighting. Wear and stress on track rails, rollers, and idlers is reduced.

POWERFUL, NEW ROCK RIPPERS—The big Greenville Rock Rippers, mounted on TD-14s or TD-18s, go wherever the tractor goes—always there to tackle hard spots. Points bite in to depths of 24" . . . rip out earth and rock with ease for 'dozing or fast scraper loading. Shanks swivel 15° in either direction. The double-acting hydraulic system puts full tractor weight on the points for fast, deep penetration. For complete data on rippers for TD-14, TD-18, or TD-24, request Greenville Bulletin IH 157.

ATECO

GREENVILLE
STEEL CAR COMPANY
ATECO DIVISION
Greenville, Pennsylvania

. . . for more details circle 279, page 16

New Publications

community and airport planning, for subsurface investigations for foundations, and for other engineering projects dealing with the soil. The report is the last from the former Joint Highway Research Project, established at the state university in 1946. The project was sponsored by Rutgers, the New Jersey state highway department and the Bureau of Public Roads. The report was prepared by Alfred R. Jumikis, William W. Holman, Robert K. McCormack, and James P. Minard of the university.

MANAGEMENT GUIDE TO OVERSEAS OPERATIONS: Business Looks Abroad at Its Opportunities and Responsibilities. McGraw-Hill Book Co., 330 W. 32nd St., New York 36, N.Y. Price $4.50. Of interest to engineering companies, contractors and individuals in highway construction work who are engaged in overseas activities.

THE ROAD AHEAD. An attractive pictorial booklet by this title has been published by Caterpillar Tractor Company to answer citizens who ask such questions as 'What will the new highway program mean to me?' 'Who is going to build the new roads?' The booklet shows step-by-step how the nation's engineers and contractors will build a new 41,000 mile system of superhighways. Copies of this booklet, Form D705, can be obtained from the nearest Caterpillar dealer or by writing to Advertising Division, Caterpillar Tractor Co., Peoria, Illinois.

HIGHWAY STATISTICS, 1955. 175 pages; published by Bureau of Public Roads. Contains statistics on motor fuel consumption, state highway revenues, highway finance, road and street mileage and similar data. Price $1.00 remitted to the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.

THE PLASTIC METHOD OF STRUCTURAL ANALYSIS. By B. G. Neal, professor of civil engineering, University College of Swansea, England. 353 p. $7.50. By John Wiley & Sons, 440 Fourth Avenue, New York 16, N. Y. Developed for the purpose of calculating the plastic collapse loads for frames, the plastic methods of structural analysis have now evolved as fully as the elastic methods. Dr. Neal provides an account of the principles and applications that lead to the ultimate objective of more rational and economical design procedures.

JOINT AND CRACK SEALING. Two papers published on the subject with Fred E. Sternberg and Warren M. Creamer the authors of one, and A. A. Anderson the other. Bulletin 138. Address the Highway Research Board, 2101 Constitution Avenue, Washington 25, D.C.

ROAD ROUGHNESS AND SLIPPERINESS. Factors and test methods are reviewed in HRB Bulletin 139, embodying articles given at the 35th annual meeting of the board. Address Highway Research Board, 2101 Constitution Avenue, Washington 25, D.C.

MIX DESIGN METHODS FOR HOT-MIX ASPHALT PAVING, Manual Series No. 2, The Asphalt Institute, University of Maryland, College Park, Md.

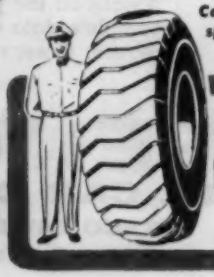
Get exactly the tread design your job requires At SOUTHERN TIRE!

AT YOUR SERVICE — the world's most complete range of tire sizes and tread designs in one shop — now at Southern Tire Company!

Whether you operate light or heavy equipment, Southern Tire can supply the tread design and size you need—and save you money at the same time. Superior equipment, including the greatest range of tire sizes and tread designs in the country, and the world's largest and finest three-sectional retreading mold, enables Southern Tire to retread any tire, regardless of growth, without buffing to the breaker strips. This, plus Southern Tire's long experience and use of finest tread rubber, assures you of guaranteed new tire service —and the tread design you need—at less than half new tire cost.

All special service tire sizes from 1100 x 24 to 33.5 x 33.

Call your favorite dealer and specify Southern Tire retreads



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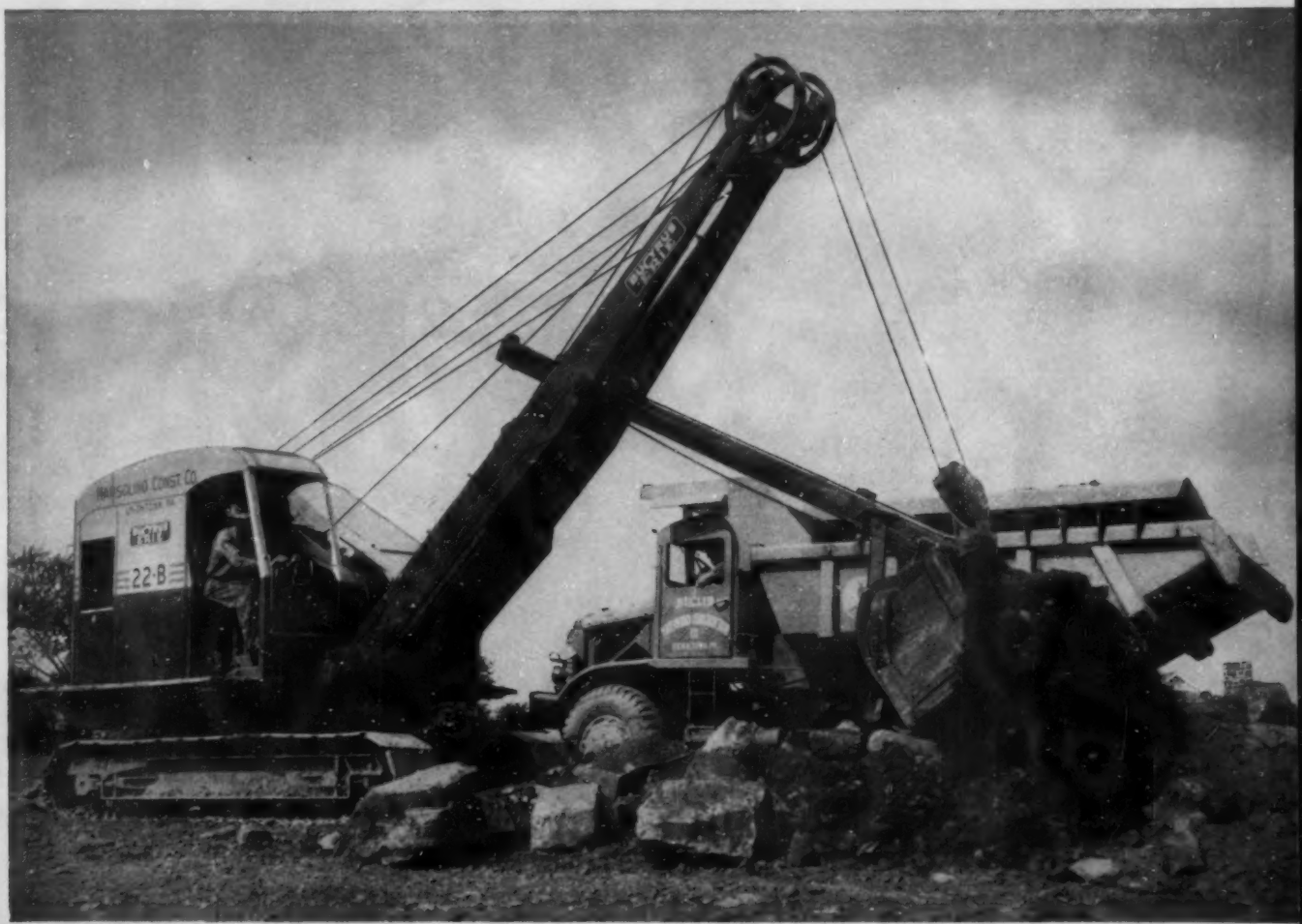
. . . for more details circle 325, page 16

6 ways Bucyrus-Erie Excavators SAVE you money to MAKE you more money



This ¾-yd. 22-B loads dirt and rock fill for a turnpike extension in Pennsylvania.

It isn't just through their extra output ability that Bucyrus-Erie excavators help you make money. They save you money in many ways, thus adding to your profits.

1 Save downtime. Cold, hard figures kept by users show that a Bucyrus-Erie stays on the job more hours, helps get the maximum work out of companion equipment.

2 Cost less to maintain. There are actually fewer parts in a Bucyrus-Erie excavator to wear out, and they are built to last — which adds up to lower cost maintenance.

3 Save fuel. Elimination of deadweight through proper design means less power wasted swinging useless metal. Smooth, direct flow of power means more of it doing useful work.

4 Cut conversion time. It's easy to convert from one front end to another. Quick convertibility gives you wider use of your machine, too.

5 Service faster. Many grease fittings are grouped at central, easily accessible points. Adjustments are easy to make — and "stay put."

6 Last longer. It's a tradition in the excavator field that Bucyrus-Eries outlast other makes, cutting your depreciation and replacement costs.

These and other savings add significantly to the profits from Bucyrus-Erie excavators. Why not learn the whole Bucyrus-Erie profit story — see your distributor or write direct for more information. 316E57C

BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN

. . . for more details circle 251, page 16

3 STAGES

of every dirtmoving job where 9-yd. D Tournapull® pays off most...

Every dirtmoving project breaks down into sections, or phases. Experienced contractors plan each part individually... treating them almost as separate jobs.

Profit-wise, it makes a lot of difference *how* you handle various dirtmoving phases of the overall project. The *methods* you use are all-important. Using the wrong equipment on any stage of the operation eats into your total net profit on the contract. Here's how speedy 9-yd. D Tournapull gets your earth-moving done at lowest-net-cost-per-yard... on each of the 3 major stages of every project.

STAGE I: before

Versatile 9-yd. D Tournapulls self-load efficiently in many materials . . . or can push-load each other for higher production.

Prior to full-scale dirtmoving, it pays to "clear the decks for action" for your big-capacity earthmoving equipment. Using big scrapers for piddling pioneering cuts . . . or for rough-grading temporary haul-roads . . . can be expensive business. When you figure your net cost on the small amount of preliminary yardage moved — based on equipment investment and hourly operating costs of pushers and larger scrapers — it's plain you're getting off to a bad start, profit-wise.

"D's" set stage for higher fleet production

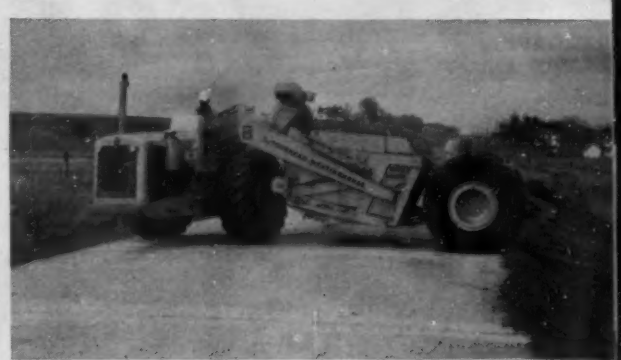
That's where your "hit-and-run" 9-yd. D 'Pulls shine. These 29.5 mph "Handyman" scrapers zip around your project . . . cutting here, leveling there . . . getting all the rough spots smoothed out for efficient operation by your big dirtmovers. These "D's" prepare rough cuts or borrows for easy production-scraper loading. They carve out shorter haul routes . . . chop down grades for faster hauls . . . get everything in readiness for quick cycles.

In dozens of money-making ways, these versatile "D's" will set the stage for higher production by your entire equipment fleet.

Push-loaded, utility-size "D" heaps king-size payload fast . . . moves a lot of dirt at low-net-cost-per-yard.

Plan your project for profit

So plan your project for profit. Arrange operations so your production earthmovers can achieve maximum hourly output. You'll see that just a few hours of advance preparation by these low-cost dirtmovers during Stage I, is your best assurance of higher output by every machine on your spread in Stage II!



"D" easily maneuvers in restricted areas where larger earthmovers can't operate efficiently. Here "Handyman D" swings around on narrow roadway, making continuous U-turn in 24'3".

Preparing site for big-capacity production earthmovers, "D" smooths and grades haul-roads . . . sets up cut, fill areas for easy operation of larger units.

Turn page for story on STAGE II

How D Tournapull pays off on all 3 stages of production (continued)

138 hp "D's" rugged construction and no-slip differential assures smooth, fast haul over any type terrain. With 5 speeds forward, to 29.5 mph, unit completes more cycles per hour than any comparable scraper.

9-yd. D 'Pull holds its own in your production fleet . . . handles sizeable yardages fast, working efficiently with your larger scrapers. Here "D" boils up profitable payload of clay and topsoil.

STAGE II: during

As production dirtmoving gets rolling on your project, your fast 9-yd. D Tournapull holds its own with the best of them. It can either take over and complete a small separate section of the project . . . or it can work right along with your larger scrapers on big production jobs. Either way — "D" chalks up an impressive volume of dirt moved per hour, at rock-bottom cost.

Because of its speed and maneuverability, the "D" positions fast in the cut . . . jockeys easily between other machines, buildings, or other obstructions along the haul-road . . . swings around in tight U-turns for shorter, faster haul-and-return cycles.

Self-loads . . . or works with pusher fleet for highest yardages

Working alone on a separate section, "D" easily self-loads to about 5½ yds. in many materials.

Dozer-blade equipped, "D's" can push-load each other to higher payloads. For production operations, on any length haul, pushers help assure maximum scraper output.

Push-loaded, 9-yd. "D's" get heaped loads fast. Units haul at high speed . . . often in 4th gear, at 20 mph. Spreads may be made on the run, in 15 seconds or less.

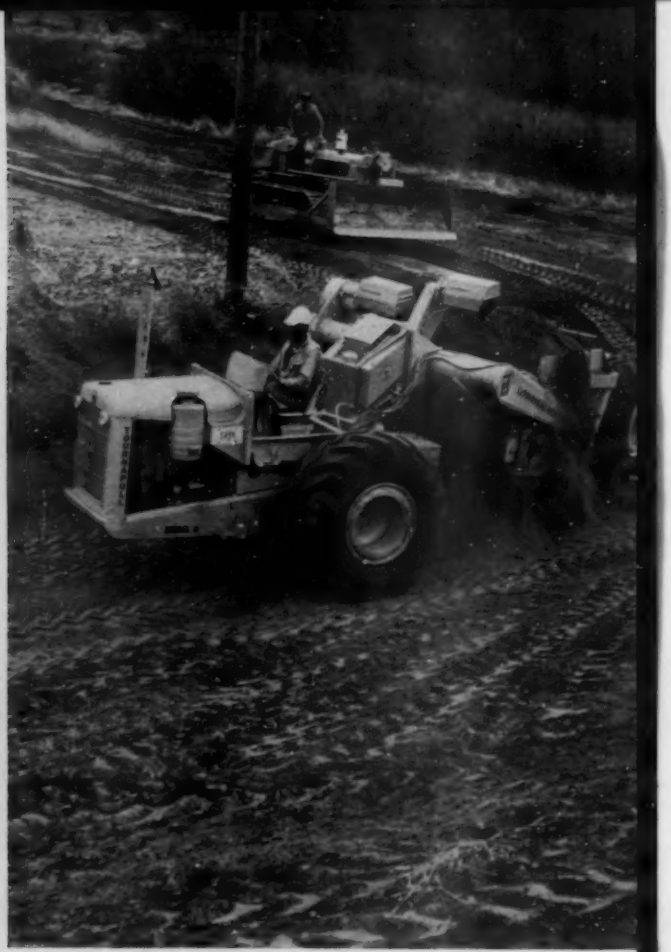
However you use fast-moving "D's" on your production fleet, they'll pay dividends for you, *fast.*

"D" has speed and capacity to work well with any equipment fleet . . . has a place on every project, large or small.

Positive-ejection tailgate, plus high apron-lift, permits either a fast dump . . . or a slow, controlled spread over a long distance. Tailgate is power-controlled forward and back — no springs.

Turn page for STAGE III

How D Tournapull® pays off on all 3 stages of production (continued)



9-yd. "D" is ideal for shouldering and backfilling around newly-poured concrete. 'Pull spreads accurately — in smooth, controlled lifts — right up to edge of slab. Because "D" meets 9-ton axle limit, unit can often return along newly-seasoned slab to speed cycle time.

Backfilling around culverts, bridges . . . constructing overpasses and access roads . . . replacing stockpiled topsoil or shouldering . . . these and dozens of other small-yardage finish jobs can be handled most economically with the "D".

STAGE III: after

When the dust settles after your production dirtmoving, and you are down to clean-up work, there are always a few scattered odds and ends of leftover dirtmoving to be done.

Here, again, is where careful planning and jobmanagement pays off. Here's where the *dirtmoving method used* may well be the deciding factor in your final profit figure on the entire contract!

Match dirtmover to job

General rule is to match the dirtmover to the size and nature of the work. If only "odds and ends" clean-up work remains, it stands to reason that your heavy earthmovers will be at a disadvantage. What you need is mobility, speed, maneuverability.

The scattered, small-yardage nature of the remaining work gives you your clue. Use a small, fastmoving scraper — one that can cover a lot of territory, and move a lot of selectively-cut dirt at low hourly cost. It's "made to order" for D 'Pull!

Seeing is believing

But . . . seeing is believing. When can we show *you* — on your own job? All it'll cost you is the price of a 'phone call. Let's set it up, right now!

. . . for more details circle 296, page 16

After your production fleet moves on to its next project, "Handyman D" takes over . . . winding up remaining clean-up tasks at lowest-net-cost. Here "D" self-loads in topsoil and clay.

"D's" fast, controlled spreading action makes it ideal for laying topsoil, or bringing access roads and overpass approaches to specified grades. Simple electric controls operate bowl, apron, and tailgate.
DP-1438-G

LeTourneau-WESTINGHOUSE Company, PEORIA ILLINOIS
A Subsidiary of Westinghouse Air Brake Company
Where quality is a habit

More Results from Men and Machines

Excerpts from selected papers given at the Western Regional Conference on Increasing Highway

VETERAN ROAD CONTRACTOR:

Help Us Improve Highway Contracting Practices

By Nello L. Teer, Jr.

President, Nello L. Teer Company, Durham, N. C.

Technically trained engineering personnel in the highway departments are performing, in the majority, details and assignments that can be done by others without engineering training, and done more satisfactorily and more economically.

The use of electronic computers and the merits of photogrammetry have received much discussion. I would, however, like to reiterate that—as a contractor who recently completed a large job with original and final earthwork computation by photogrammetric methods—our firm endorses final payment based on photogrammetry. Our endorsement and acceptance are based on the assurance of high standards of workmanship and the willingness of

(Continued on page 96)

GRADING EQUIPMENT MAKER:

How New Machines Are Cutting Project Costs

By Vernon W. Imes

Caterpillar Tractor Company, Peoria, Illinois

An example of the money and time (and engineering manpower) saved by equipment advances is afforded by the motor grader. As you know, the grader has always been a finishing tool. Its blade capacity, horsepower, top speed and weight have never been quite as important as the operator's ability to see well, control the blade firmly, quickly, and accurately and to reach an assorted number of blade positions to do a wide variety of jobs.

This is in contrast with the dozer or high-speed hauling unit where the opposite order of importance is put on the above factors.

So, tomorrow, as in the past, the operator's comfort, visibility, the controls he has to work with and the blade positions he can obtain will continue

(Continued on page 101)

Contractors and Equipment Makers Get Down to Cases at Western Conference on Productivity

Engineering Productivity; Held in Los Angeles, California, March 5-7, 1957.

ANOTHER CONTRACTOR SPEAKS:

Better Field Cooperation Will Expedite Our Work

By W. F. Maxwell

W. F. Maxwell Co., Contractor, Los Angeles, California

Highway department leaders:

1. Up-grade your good young engineers to the maximum extent possible under civil service laws. Support legislation to change restrictive, outmoded laws concerning civil service ratings and salaries (your contractor's association will help). Assign an older engineer to evaluate the resident's ability and possibilities. Don't lose good engineers because of the department's lack of interest in them. Don't let good, young, ambitious engineers languish in dull, routine jobs.

Go out in the field and look for good residents

(Continued on page 109)

CONCRETE MACHINERY EXPERT:

The Concrete Industry Has Big Part to Play

By Austin K. Thomas

Chain Belt Company, Milwaukee, Wisconsin

Can the concrete mixing and placing machinery industry contribute to greater productivity? Yes, in two ways. By more efficient use of machinery now available, and by encouraging development of new and improved machinery.

In the seven-year period 1948-1955, improved construction machinery contributed almost an 80 per cent increase in highway productivity per man hour. I am sorry to say that very little of this contribution came from the concrete mixing and placing field.

About 30 years ago while I was serving as a highway inspector and engineer, the contractor on my job told me I was his greatest handicap to the

(Continued on page 110)

Nello L. Teer, Jr., Speaks Out On Contracting Practices

Contractors today are accepting earthwork computations based on photogrammetry. This leader also suggests that manpower can be saved, job costs cut and work further speeded by writing clearer specifications, tightening up on prequalification, putting right-of-way and utility relocation work on a more orderly basis, and helping the contractor get his money out more promptly.

(Continued from page 94, Western Conference on Highway Engineering Productivity)

the engineers to correct promptly obvious errors where discovered.

The development and acceptance of photogrammetric methods and the use of electronic computers will, I am sure, be the greatest of all factors in increasing highway engineering productivity.

There are, however, other important steps that can be taken to improve and add to the efficiency of our contractors and highway personnel. It is obvious, I think, that a healthy and financially sound contracting industry is essential to the final success of the challenging highway program. Irresponsible, inexperienced, financially unsound highway contractors can only produce chaotic results, with corresponding adverse public relations and damage to the highway department and to the highway contractors. It is essential that the industry's relations with the press and the public be of the highest order. If work is improperly designed or constructed, and the public doesn't receive true value for their tax dollar, we shall all be subject to the deserving penalties of public censure and severe corrective legislation to insure proper results.

Bidding requirements should include prequalification of contractors to assure the elimination of fly-by-night, inexperienced promotors and camp followers. Licensing boards should be eliminated or be required to license promptly any qualified contractor. In too many instances state licensing boards are being used to restrain and block qualified contractors from freely bidding work they are capable of performing.

BIDDING RULES ENFORCED

Bidding requirements should be strictly enforced inasmuch as they are a keystone in the arch of mutual respect and the sanctity of contracts. When bidding specifications are ignored or waived, the first step in tearing down the competitive contract system has begun. It is our sincere belief that bids as submitted should comply exactly with the specifications and be inviolate.

Highway specifications and contracts should be annually revised and every effort should be made to secure standardization of terminology and design where possible. Contractor organizations are willing and able to assist in the development and review of contract terms and specifications. These reviews will result in clarity of intent, and the elimination of unnecessary, expensive, time-consuming restrictions. Accordingly, the reviews will reduce misunderstanding and resulting claims.

It would be interesting to know the total annual hours spent by highway engineers in discussions, preparation of studies, arbitration or court hearings and other time-consuming functions that are required as a result of contract claims. These man-hours alone could probably construct a substantial section of our Interstate system.

While revising contracts and specifications, the acceptance of the following revisions would be extremely beneficial in increasing the productivity of the contractors and engineers.

1. *Give Us Rights-of-Way.* Legislation and methods should be developed to guarantee to the contractor 100 percent of the right-of-way upon execution of the contract. The contractor, in preparing his estimate, envisions the most eco-

(Continued on page 100)

Part of an Outstanding Conference on Procedures

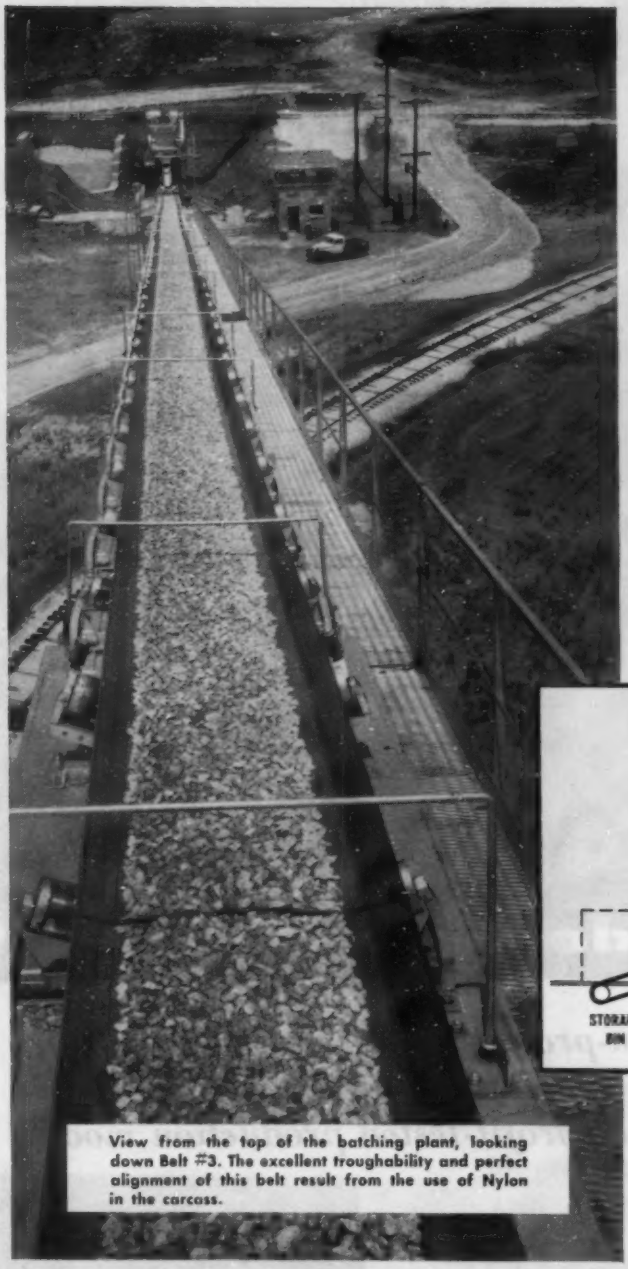
The briefed papers of four selected speakers given on these pages are from panels No. 9 and 10 of the Los Angeles Conference on "Increasing Highway Engineering Productivity," held March 5-7, 1957.

In addition to the papers here presented, noteworthy discussions were also given by M. C. Ham of Barber-Greene; Ben Ligenfelter of Koehring Company; R. P. McKenrick of Construction Industries Manufacturers Association; H. L. Plummer of the Wisconsin Highway Commission; Joseph Bonness, Wisconsin highway contractor; Spencer Webb of Webb and White, Los Angeles road contractors; and by the conference's moderator, H. A. Radzikowski of the BPR in Washington.

Two score other speakers at other panel sessions covered topics related to electronic computer application in earthwork computation, bridge calculations, traffic studies, cost analysis, and other phases in highway engineering; also covered were such topics as simplification of photographic and records reproduction, standardization of bridge designs, and other labor saving ideas.

The full texts will be published at a later date.

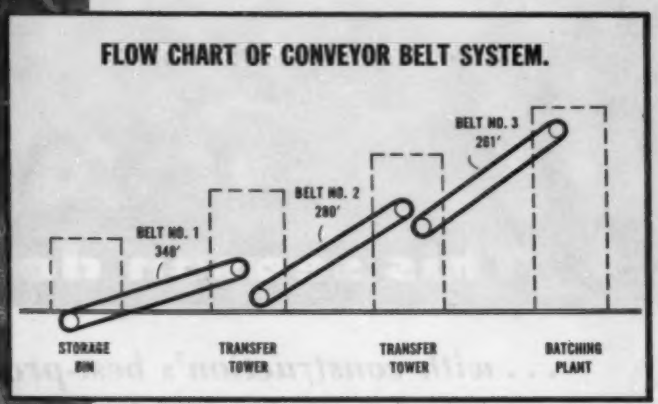
The Conference was initiated by the Bureau of Public Roads, California Division of Highways and University of California, with AASHO and WASHO sponsorship. Attendance totaled 485 representatives of road agencies, municipalities, colleges, trade associations, equipment makers and other bodies.



View from the top of the batching plant, looking down Belt #3. The excellent troughability and perfect alignment of this belt result from the use of Nylon in the carcass.

US RUBBER CONVEYOR BELTS

Push-Button Control and U. S. Conveyor Belts help turn out 120 cu. yds. of concrete per hour



"This is the largest concrete plant* of its type in the world," says the plant's manager. "In aiming to turn out the best concrete at the lowest possible cost we require a highly mechanized operation."

And that's what this plant has. Almost 2,000 feet of U. S. Rubber's 30" wide U. S. Matchless patented Style XN conveyor belting carries raw materials through the reclaiming tunnel, then up a steep grade to a turn head—electrically controlled—and finally discharges the cargo into the always-hungry jaws of the huge batching plant.

One man in a control tower oversees the entire operation, from storage pits to plant bins. The control board tells him when a bin is getting low. By pressing a button he can start one of the three U. S. Belts hauling sand, stone, or other aggregates to the proper bin. "We expect many years' service from these belts," adds the plant's president, J. Roy "Cap'n" Pennell.

This is another good example of U. S. Rubber's Three-Way Engineering, in which "U. S." engineers work as a team with the plant engineers and the conveyor system engineers . . . to obtain the *right* belt for the job. This type of assistance, plus a complete line of conveyor belting, can be obtained at any of our 28 District Sales Offices, or contact us at Rockefeller Center, New York 20, New York.

In Canada, Dominion Rubber Co., Ltd.

*Greenville Concrete Co., Greenville, S. C.

US RUBBER Mechanical Goods Division

United States Rubber

. . . for more details circle 336, page 16

This season do more BIG work

. . . with construction's best-proved torque converter tractors
. . . backed by 17 years of on-the-job experience
. . . thousands of profit-tested production models

More efficient dozing—Matched engine-converter-transmission team lets operator choose speed range for each job as he starts . . . finish most jobs without further clutching or shifting (except for reverse). With full control at throttle, he can work safely and efficiently regardless of terrain.

Faster on tough scraper jobs—These Allis-Chalmers tractors multiply torque up to four and a half times . . . develop maximum drawbar pull when it's needed most . . . start the load smoothly regardless of material in the cut . . . automatically accelerate to the highest speed that conditions permit.

Nothing like 'em on big loading jobs—The 3-yard HD-16G and 4-yard HD-21G tractor shovels are tough, mobile, flexible enough to pay big dividends on many projects. Operators can crowd surely and steadily . . . without stalling, shifting gears or losing control of the bucket because of slow engine speeds.

per man-hour . . . at lower cost

No construction equipment dealer in your area knows torque converter tractors as well as your Allis-Chalmers dealer. See him . . . and get the benefits of 17 years' experience working for you. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

Longer life for big equipment—Hydraulic torque converter cushioning reduces shock and vibration on the power train, the entire tractor and its auxiliary equipment—mounted or drawn. That means less downtime, more production time . . . better profit protection on any job!

ALLIS-CHALMERS

Engineering in Action

. . . for more details circle 238, page 16

Plain Talk from a Successful Contractor

A program of the magnitude of ours will undoubtedly be a temptation to political opportunists and unprincipled disciples of the "fast buck." We should all willingly accept the responsibility to help police our industry and to stand vigilantly against those who will bring discredit to our profession.

We have personally experienced threats and demands from top officials for political contributions and directions relative to allocations of bonds and insurance business to those in the inner circle. I submit to you that the growth and continuation of such political skulduggery will bring shame and disgrace to us all.

The integrity of the contract system must be preserved and the administrators of our highway program must develop and adhere to the necessary safeguards that will guarantee to the public the very best highways and the very lowest costs. There can be no room for graft, kickbacks or political bloodsucking.

CONTRACTOR SPEAKS OUT

(Continued from page 96)

nomical plan of operation. Any deviation from these plans due to right-of-way delays accordingly increases his cost and, of course, reduces his efficiency.

2. *Green Light on Utilities.* Provision should also be made to assure the contractor of the immediate removal of interfering utilities. Utility companies should be required either to enlarge their organizations or to secure the prompt assistance of independent contractors to carry out the work. If utilities require moving, I can see no valid reason for imposing delays and inconvenience on the contractor.

3. *Results Specifications.* Specifications should be written prescribing results and leaving the details to the contractor, who, if prequalified, has already demonstrated an ability to perform.

MIXING TIMES VARY

We find many variations in mixing time for concrete or asphalt construction. Surely your engineers can agree on a satisfactory minimum mixing cycle. A reduction of a few seconds in a mixing cycle will substantially increase production and correspondingly reduce labor cost.

Full-width concrete paving should be universally permitted and, with the development of joint sawing, expansion, load transferring, dummy and other joints should be largely eliminated. Superior riding surfaces will result along with lower construction and maintenance cost.

Specialized equipment should be accepted for use in *every* state, once it has been approved by the Bureau of Public Roads.

4. *Standardized Plans.* Plans should be standardized as much as possible. The standardization of structure design would permit use of mass produced prefabricated metal forms or the re-use of contractor-constructed forms with resulting increased production and savings in costs.

Standardization would also permit faster fabrication and simplification in production and delivery of structural and reinforcing steel.

5. Prestressed concrete should be utilized to the greatest extent possible to expedite construction and to relieve the shortage of structural members. Based on current price levels, prestressed girders, piling, etc., can be substituted for structural steel members with a reduction in cost and a radical improvement in delivery and final completion. In spite of the testimony by the heads of big steel, we are being quoted approximately 24 months for structural steel delivery. Alternate bids where feasible would highlight the savings in time and money.

6. *Prompt Payment.* The contractor's over-all efficiency can also be improved through a reduction in his financing load. Payment practices now generally in effect are both antiquated and burdensome. Millions upon millions of dollars are destined to be frozen in retainages and other hold-backs unless contract terms and operating practices are revised.

Payment and performance bonds should provide all the necessary protection to the contracting agency. Retainages from periodic estimates should be in no case in excess of 5 percent and this should be reduced further to one or two percent by final completion and inspection.

MONEY IS A TOOL

The adoption of photogrammetry and electronic computers should assure the contractor of receiving his final payments within a relatively short time but in any event he should be guaranteed payment within 60 days or the payment of 6 percent interest until paid. Money is as much the contractor's tool as his tractors and pavers and when his funds are unreasonably tied up the effect is the same as locking up his shovels and trucks for the same period.

To assist the contractor in financing his works and to reduce the interest cost (which are just as much an item of cost as cement and steel), estimates should provide for 100 percent payment for materials going into the work. Allowances should be made on large projects for mobilization, bond, plant development and other large expenditures which could be amortized over the life of the contract.

Monthly estimates should be paid to the contractor within ten days from estimate date. If the contractor can gear his organization to perform thousands of dollars worth of completed work per day, surely the highway departments can process and pay estimates within a week or ten days.

ARBA Engineering Division

As part of the expansion of activities of the American Road Builders Association, a new Division on Engineering and Financing has been organized. The division will be composed of financial and consulting engineering leaders. The first president is O. J. Porter of Porter, Urquhart McCreary and O'Brien, consulting engineers of Newark, N. J. Vice President is C. Cheever Hardwick of Smith, Barney and Company, of New York.

How the New Earthmover Units Are Cutting Project Costs

Case examples of the difference in hourly production and job costs of using the right machines for the work, compared with using obsolete or under-powered units.

(Continued from page 94, Western Conference on Highway Engineering Productivity)

to be the first considerations in motor grader design.

A recent major development is an electronic device which assists the operator in his control of the blade, particularly in finish grading. It works like this: the operator sets a dial to the slope he is trying to obtain. This may be a 4:1 ditch back slope or it may be the crown of a road or curve super-elevation or sometimes it may be merely level. The operator then sets one end of the blade at the grade indicated by the stakes. Then, regardless of irregularities affecting a front wheel or the depth selected by the operator on the operator-controlled end of the blade, the cut left by the blade will always be at the slope selected on the dial. Obviously the benefit is two-fold. The operator need direct his attention to only one end of the blade, and each pass has the correct slope. For example: In the construction of a parking lot a grader could begin on a row of stakes along one side of the lot, work the grade to the opposite side —be it 40 ft. or 400 ft. across—and leave the area to be checked by a single level set-up.

This automatic blade control could have a favorable effect on staking requirements. One highway contractor, on watching the attachment for the first time, estimated it would cut the machine hours of finishing time to 1/5th the hours required with a standard machine. Here are the results of a comparative test on a section of the Santa Ana freeway:

Chart 1.

3100 ft. of finish grading

No. 12 motor grader with Preco Blade Control	No. 12 without Preco Control
Time Required	
11½ hours	24¼ hours
Variation	
—.02 to +.05 ft.	.00 to +.20 ft.

Although this device is electronic it is durable and simple to repair (the control consists of several "black boxes," each of which is replaced as a unit). The relatively small extra price for this attachment is insignificant compared to the increased productivity and decreased staking and checking requirements.

Chart 2—How Heavier Pusher Cuts Costs

	200 hp Pusher	320 hp Pusher
Loading time	1.25 min.	1.00
Load (average of weighed loads)	17 bank cu. yd.	18
Haul unit cycle time	5.00 min.	4.75
Trips per hour	12.0 trips	12.6
Production	204 cu. yd. per hr.	227
Production of 3 haul units	612 cu. yd. per hr.	681
Approximate cost per hour for equipment and operators:		
3 haul units	$ 60	$ 60
1 Pusher	$ 16	$ 19
1 Compactor	$ 15	$ 15
1 Motor grader	$ 12	$ 12
Total hourly cost	$103	$106
RELATIVE COST PER CU. YD.	16.8¢	15.5¢

TRACK TYPE TRACTORS

Here, brute force—made up of more weight for traction and more horsepower to supply the pounds pull requirement—is the keynote. Possibly the biggest track type tractor improvement was the introduction of a larger tractor, with many improvements being made in operator's comfort, visibility, easier controls, better stability and many other refinements in the 100 to 200 engine hp sizes.

Let's look at ripping to see why weight and horsepower are so important:

Difficult materials require a maximum amount of weight on the ripper point if penetration is to be obtained. Once the tooth is in the ground, a maximum amount of drawbar pull must be *available* (i.e., sufficient hp) and *usable* (i.e., sufficient traction—more specifically, the weight of the tractor). The rear, case-mounted, hydraulic ripper on the largest tractor answers these requirements:

1. Weight for tooth penetration (the entire rear of the tractor, weighing a total of 87,000 lb. can be lifted off the ground with a single point).
2. Horsepower for pulling the tooth (320 engine hp).
3. Weight to enable use of the H. P. (87,000 lb. total weight on the tracks).

Contractors who have used both the 210 hp tractor-ripper and the 320 hp tractor-ripper know there is plenty of material in the U. S. which the bigger machine will handle but the smaller machine just won't touch.

Why so important? Think of all the bids that are lost for ½¢, 1¢ or 2¢ per cubic yard. The average bid price for unclassified excavation is approximately $1.63, with roadway excavation at $1.12 per cu. yd. Any contractor who bids rock prices (i.e., drill, blast, shovels, and trucks) on a job that could be ripped and push-loaded into scrapers simply will not get the job.

There is considerable material that is being ripped today which was considered to be unrippable only two short years ago. However, even those with wide experience cannot predict or explain where the exact line is. They just try it and see. There appears to be unlimited opportunity for some materials classification work in this field.

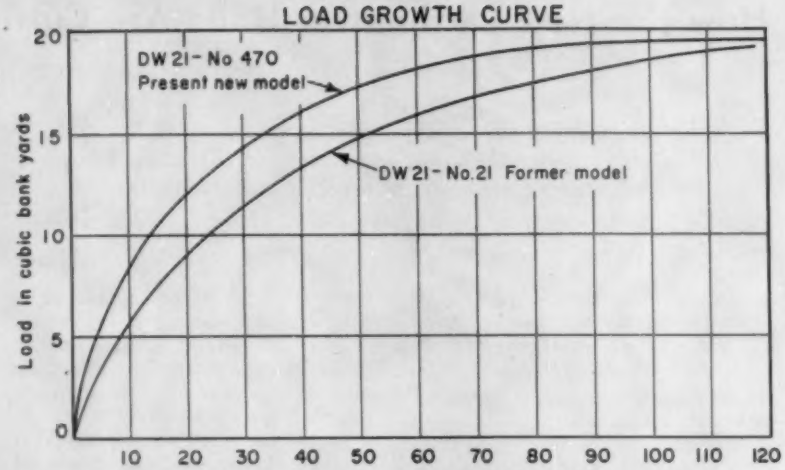
The larger tractor has also won acceptance in the cut as a pusher. The reason is apparent from the accompanying comparison made in California. See Chart 2.

Of course, the difference in hourly cost of the two pushers includes the difference in original price which must be written off and the difference in operating costs such as fuel, repairs, etc. Hence the 1.3¢ could be the difference in profit or bid price.

This example illustrates that if a bigger tractor will increase production of a spread by 10 per cent, then the contractor with exactly the same equipment, except for his smaller pusher, is at a bidding disadvantage. In fact, he is not competitive and may find himself with no work —or may be working at no profit.

WHEEL TRACTOR-SCRAPER

Most contractors keep modern, up-to-date equipment. They must if they are to bid competitively. "Unavailability" (i.e. downtime), one of the diseases of aged equipment, is one of the most costly items in the construction game. Also, machines leaving factories today have many improvements that offer *increased production* that the obsolete machine owner misses. Then add to "unavailability" and "lost production" the fact that repairs and overhauls are increasingly more expensive as a machine ages and it is easy to see why those few contractors in the old machine category are not competitive bidders. No contractor by choice lives with those three "headaches": *Unavailability, yesterday's production rate, high repair costs.*



● **How an improved scraper model helps get large loads in any given push-loading period—an example of the profit-making difference frequently offered by latest equipment.**

Modern hauling units with higher availability, lower repair costs, and design features that offer increased production over yesterday's model are indeed important to the success of the gigantic construction program ahead of us. Let us not forget to keep the payment schedule in step with the increase in production of the newer machines. Let's look at a typical hauling cycle and see what is required of today's earthmovers.

Cut: Bigger loads in a shorter loading time.

Accelerate: Plenty of hp per lb. of gross weight.

Haul: Higher hauling speeds

1. Bowl latch to instill operator confidence.
2. Good riding characteristics to permit use of higher speeds.
3. Good engine "lugging" (i.e. torque) characteristics to handle small variations in grades.
4. More capacity for each ton of machine weight.

(Better metals, better design, replacement of standard channels and sections with designed members to reduce weight).

Dump: Fast ejection—cable saver permits operator to give attention to higher speed while dumping.

Clean ejection—material gets expensive if it is hauled to the fill more than once.

Accelerate: High ratio $\frac{\text{H. P.}}{\text{empty weight}}$

Return: Less machine weight to haul back to the cut.

Of course, the need for skilled operators and experienced supervisors will be critical because, in the performance of construction work, judgment is needed at every turn. As an example, only recently did the term "load growth" have any meaning. Prior to two years ago, little thought was given to the "loadability" of a scraper. The thought was "as long as you are making a trip, fill your pockets and take all you can." We now know (and more contractors will have to take note) that the load which can be obtained—and the *time taken to get that load*—are both important.

Chart 3 illustrates what can happen when operators try for that extra load:

In addition, the machine spending 1.5 minutes in the cut ties up the pusher for .5 min. longer every load. There a pusher could load out 35 loads per hour with the standard machine, it could make only 27 with the sideboarded machine. Let's underline a point here: All machines in a "spread" must be balanced because the operations are closely interrelated.

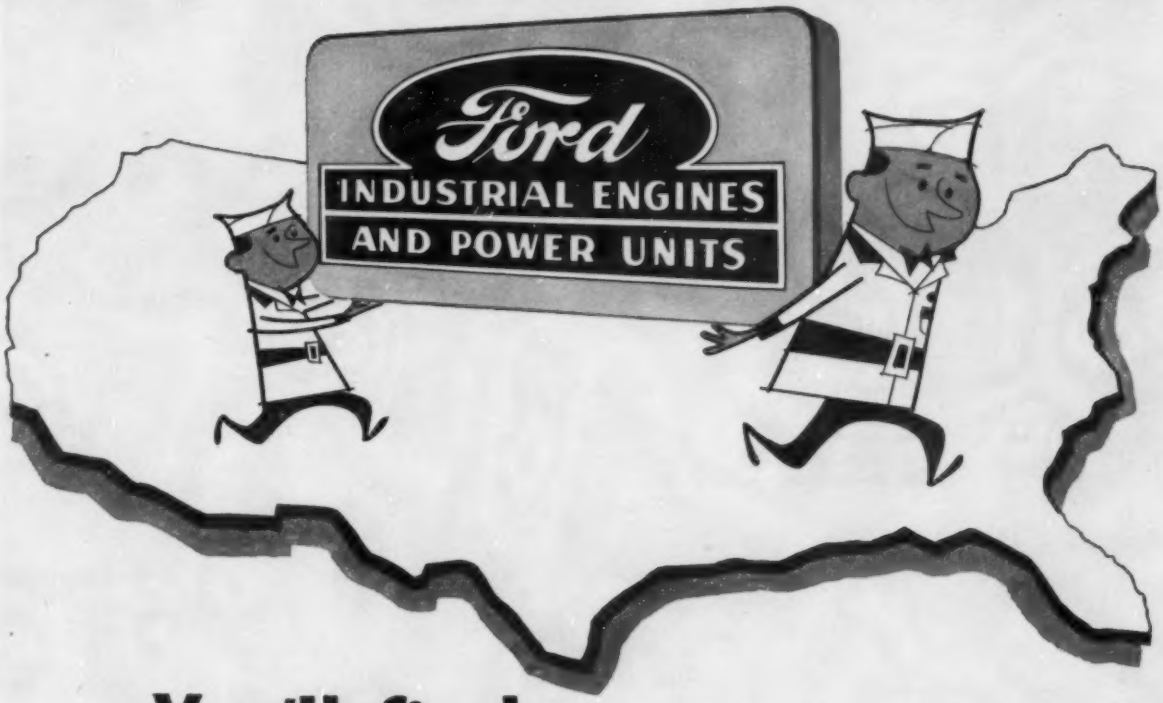
(Continued on page 110)

Chart 3—Why Bigger Loads May Not Pay

Data for DW21-No. 470

Production on a ½ mile haul	Standard	With Sideboards
Load	18 bank cu. yd.	20
Cycle Time:		
Load	1.00 min.	1.50
Haul, dump, return	5.00 min.	5.25
Time per trip total	6.00 min.	6.75
Trips per 60 min.	10 trips	8.9
Production	180 cu. yd. per hr.	178

Whether it's repair or replacement...



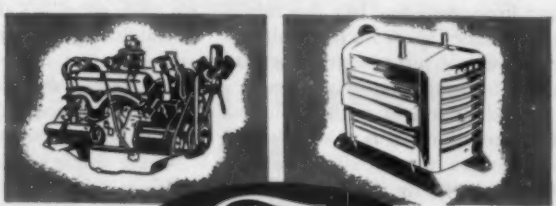
You'll find Ford Industrial Engine Service is available everywhere!

Know why so many industrial power users are swinging over to *Ford* power? One reason is service.

Ford power users *know* there's always a Ford Dealer nearby to give service when it's needed . . . to keep downtime at a minimum. And because Ford Dealers carry an inventory of the more commonly purchased engine parts, the Ford power user need never invest in a big parts inventory of his own.

Also, across the country, you'll find a network of newly established Ford Industrial Power Headquarters. Each is equipped to repower any type of equipment with dependable, low-cost Ford power.

It's the availability of service like this—wherever you are—that helps keep your operating costs *low*. If you are considering a new power unit or engine assembly—4-, 6- or 8-cylinder—see your Ford Industrial Products Dealer. He will be very happy to discuss your power requirements with you and make sure you get the one right power unit for *your* job. Write to the address below for further information.



Ford
INDUSTRIAL ENGINES
AND POWER UNITS

INDUSTRIAL ENGINE DEPARTMENT • FORD Division of FORD MOTOR COMPANY
P.O. Box 598, Dearborn, Michigan

YOUR JOB IS WELL-POWERED WHEN IT'S FORD-POWERED!

. . . for more details circle 269, page 16

Choking, blinding dust like this causes local resentment as well as presenting traffic hazards

Keep dust and danger down with low-cost COLUMBIA CALCIUM CHLORIDE road treatment

Don't let the roads you're responsible for fall into the too common condition shown above. The heavy dust thrown up from this surface is a major irritation to drivers and to residents. It's a real danger to life and limb. And dust like this means more money spent for materials and maintenance, just to restore the road that's blowing away.

Road treatment with Columbia Calcium Chloride is a surprisingly inexpensive way to eliminate dust formation during the hot, dry summer months ahead. One full application late this spring after shaping and crowning are completed, one or two "sweetening" shots during the summer . . . and you're assured of smooth, compact, dust-free surfaces that cut maintenance costs all year 'round.

If you haven't already, plan now to get Columbia Calcium Chloride on roads soon. It's also a great help in stabilizing shoulders and improving detours. Wherever you're located, Columbia Calcium Chloride makes both your roads and your budget look better and last longer.

Order ample stocks of Columbia Calcium Chloride today. For any added information, contact the Calcium Chloride Department at our Pittsburgh address or at any of our convenient district offices.

Consolidated shoulders should also be stabilized with Columbia Calcium Chloride to provide smooth, safe emergency surfaces

COLUMBIA-SOUTHERN CHEMICAL CORPORATION
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY
ONE GATEWAY CENTER • PITTSBURGH 22 • PENNSYLVANIA

DISTRICT OFFICES: Cincinnati • Charlotte • Chicago
Cleveland • Boston • New York • St. Louis • Minneapolis
New Orleans • Dallas • Houston • Pittsburgh • Philadelphia
San Francisco
IN CANADA: Standard Chemical Limited and its Commercial Chemicals Division

. . . for more details circle 265, page 16

In carrier landings, planes coming in at more than 100 knots are stopped in a split second. This amazing performance is made possible by having each plane hook onto one of several wire ropes stretched across the flight deck. Both plane and rope receive an almost unbelievable shock at the moment of contact. Needless to say, only top-quality wire ropes can be used for this application because . . .

you can't bargain with safety

While your use of wire rope differs from this carrier application, *safety should be just as important to you.* For, although a "bargain" rope may save you money, it can cost you your peace of mind. So don't bargain with safety. Buy a rope that's a *quality* rope—buy Wickwire Rope. 5049

WICKWIRE ROPE — A CF&I PRODUCT

CF&I

PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

LOOK FOR THE **YELLOW** *TRIANGLE*

THE COLORADO FUEL AND IRON CORPORATION—Denver • Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tulsa
PACIFIC COAST DIVISION—Los Angeles • Oakland • Portland • San Francisco • Seattle • Spokane
WICKWIRE SPENCER STEEL DIVISION—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • New Orleans
New York • Philadelphia

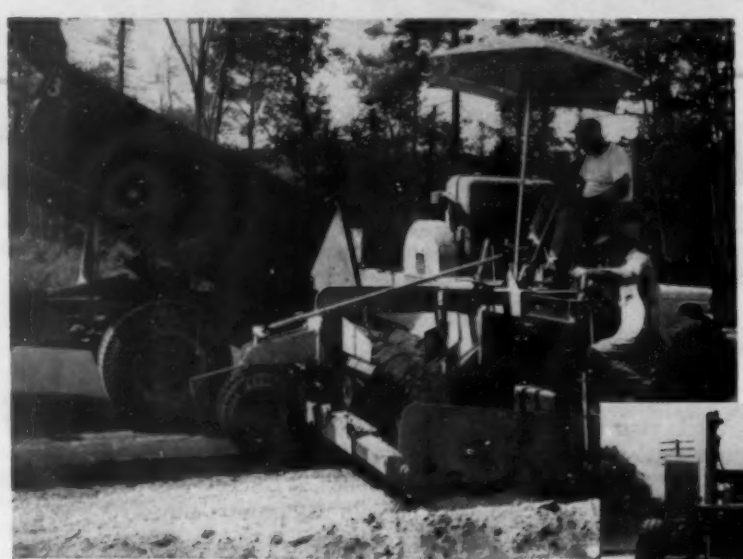
. . . for more details circle 264, page 16

For Low Cost Bituminous Paving from Superhighways to Driveways . . .

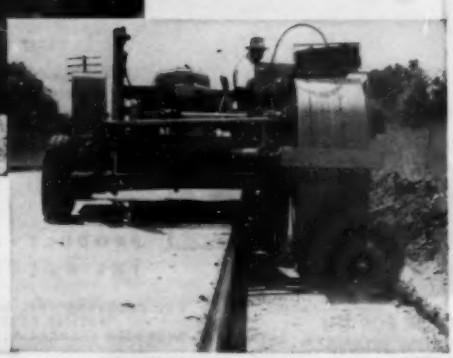
Get all the advantages of Blaw-Knox Bituminous Paving Equipment

For any type of bituminous paving operation, the efficient production of Blaw-Knox bituminous paving equipment will keep operating costs at a minimum. Where big yardages are involved for superhighways, airports or turnpikes the combination of Blaw-Knox PF-90 Bituminous Paver Finisher laying asphaltic concrete on base course material laid by a Blaw-Knox Base Paver will assure big profitable production. Where the jobs are smaller and working area confined such as driveways, parking lots, alleys, play areas, or streets, the Blaw-Knox PF-45 Black Top Paver will give you the kind of production that will mean money in the pocket. When shoulder paving or road widening are involved the Blaw-Knox Road Widener and Trench Roller team will reduce hand labor, wasted material, form setting and rolling time.

All units in the line of Bituminous paving equipment are engineered to give maximum versatility. They can be adjusted to work in various widths and handle many types of material or mixes. For complete information see your nearest Blaw-Knox distributor.



Road Widener can be used to spread gravel or pave concrete and asphalt on shoulder paving or road widening jobs. They can be adjusted to work from 18″ to 10′.



Trench Roller speeds trench compaction in either narrow or wide trenches. Rolling width and depth can be adjusted while roller is in motion.

Model PF-90 Bituminous Paver Finisher has high capacity features for big job production. No other paver offers its combination of rubber-tired mounting, paving speed, paving width, capacity and high travel speed — features that mean more tons per shift on day-after-day jobs.

Model P-150 Base Paver spreads big tonnages of base course material without segregation. Its oscillating screed knits fine or coarse material into an even compact base course that is true to grade and crown.

Model PF-45 Black Top Paver assures big profits on small to medium black top paving jobs. Its rubber-tired mounting, capacity, high travel speed and maneuverability save time and hand labor when working in confined areas or on scattered jobs.

For complete information of the complete line of Blaw-Knox bituminous equipment send for the following bulletins — for the Model PF-90 Bituminous Paver Finisher, No. 2475; for the Model P-150 Base Paver, No. 2457R; for the Model PF-45 Black Top Paver, No. 2539; for the Road Widener, No. 2458R and for the Trench Roller, No. 2497.

BLAW-KNOX

BLAW-KNOX COMPANY

Construction Equipment Division

44 Charleston Ave., Mattoon, Illinois

. . . for more details circle 250, page 16

buy from the line of strongest design... Hercules!

Hercules Model 1215 high-speed telescopic hoist and CD-20 batching body handles four 5,150 lb. batches for J. A. Jones Construction Co.

for high-speed, cost-cutting batching work...

New Hercules hoist raises and dumps *in less than 6 seconds!*

2,500 ft. of 24 ft. x 9 in. slab per 9 hour shift! That's the amazing production pace maintained by J. A. Jones Construction Co., Charlotte, N. C. on a recent by-pass job near Mansfield, Ohio—thanks to Hercules' new high-speed telescopic hoists.

Because the batch trucks could back into the skip, dump, and pull clear *in 11 seconds*, the dual-drum pavers were able to deliver a 37.4 cu. ft. mixed batch at 51 second intervals!

Especially designed for Jones' use on this job, the new Hercules high-speed hoist raises to full dump position in 4 to 6 seconds. A special new bleeder valve provides hydraulic cushioning at the end of the lifting stroke. And, accelerating the truck engine at the top of the stroke provides a rapid 4 to 10 in. rising and falling motion of the truck body. Complete, clean dumping of each batch is assured, without "frogging" the truck. According to the contractor, Hercules 6 second, 4 batch equipment has reduced his investment in batching trucks 20%.

See your Hercules distributor . . . he'll show you how this new hoist and batching body can boost production and cut costs on your paving jobs, too. Call him now! AA-4612

HERCULES STEEL PRODUCTS COMPANY, GALION, OHIO

. . . for more details circle 282, page 16

Common-Sense Ideas for Getting the Road Program Moving

This western highway contractor urges quicker up-grading and training of resident engineers to cooperate better with contractors to get the project done.

(Continued from page 95, Western Conference on Highway Engineering Productivity)

among your young engineers and inspectors and bring them along carefully, as a contractor would. Don't waste engineering talent or harass the contractor's forces by staffing jobs with large inspection crews. A good resident engineer needs very few inspectors on highway and bridge work. The resident does need clerical help to fight the ever-increasing load of paper work. Give him this help, and don't waste engineering personnel on it.

Keep teaching your resident engineers. Never mind the "book." Teach them to get along with people, to cooperate. Impress on them that an important part of their job is to help the contractor speed up and maintain maximum production. Tell them they will be rated on their ability to cooperate as well as on the written exam which reflects their technical ability.

Some young engineers have the old idea that the contractor is an S.O.B. until proven otherwise. Some contractors may merit this, but most do not. I would suggest proper orientation of residents before their first assignment and refreshers later.

2. Prequalify your contractors. Once prequalified, give the contractors a good volume of work to bid on within his prequalification rating. Don't limit the state, or penalize the contractor, by committing your department to jobs of a certain size.

Much has been said about big jobs being the only way to accomplish this program. It is my considered opinion that this position is without foundation in fact. When you have an important rush job to do, you don't use a portion of your manpower and equipment; you employ all available assets in a maximum effort to attain the result required.

Competent prequalified contractors come in all sizes. Survey your contractors, size your projects in accordance with the abilities of the prequalified contractors regularly doing your highway and bridge work.

Schedule your job lettings well in advance. In setting bid dates, consider the working season, get your river work and difficult wet jobs let in the early spring. Don't wait until summer and then blame the contractors for poor progress under rain and flood conditions the next winter. Given a good start in the spring, a contractor can often afford to spend considerable additional money to secure a job by fall, thus giving the state beneficial occupancy months before anticipated.

NOT UP TO POTENTIAL

It has been stated several times in authoritative publications that highway contractors are presently doing about 50 percent of their potential volume of work. This is particularly true, in California, of contractors who are in the middle bracket; that is, those who have volume of $1 to $2.5 million yearly.

3. Cooperate with contractor organizations. Set up formal scheduled round table discussions with committees of contractors who are designated by the contractor associations. Discuss your problems with them on an industry level and, after proper evaluations, accept their advice and suggestions. Discuss their problems and take positive action to help solve them.

4. In planning roadwork, eliminate gingerbread, especially fancy transition sections in pavement, curb, gutter, etc. Eliminate tapers, variable depths and overlapping foundations courses. Keep drainage structures adequate and simple, use standard pipe in lieu of boxes where possible. Standardize size and detail of box culverts, particularly within a project, to permit mass production. Eliminate culvert wing walls. Use large simple headwalls. Provide for jacking of culverts under railroads, important cross highways, etc., to avoid slow stage open cut construction.

5. In planning bridges, take aggressive action to simplify and standardize, use standard size round columns in lieu of rectangular, avoid T-girder construction, use steel girders, prestressed girders, box girders and slab decks.

In writing specifications and bid proposals, provide for alternate methods on items such as using prestressed concrete girders in lieu of structural steel. Open up your specifications to require the end result necessary to the design criterion but permitting the widest possible latitude in use of new methods and equipment. Permit and encourage contractors to try new ideas and equipment.

6. Pay monthly estimates on time. Here in California the department pays 90 percent of the work done and materials delivered by the 20th of the month on the 5th of the following month. There are no delays. To avoid a delay between the time the project is completed and the contractor approves all final pay quantities, this state pays a semi-final estimate within 60 days after acceptance of the project which returns to the contractor his retained percentage and moneys due on approximate final quantities.

The division of highways and the contractors' organizations are presently sponsoring legislation which will permit the director of public works to cease retaining moneys on a contractor's estimate after 50 percent of the project is completed providing the contractor's progress is satisfactory. This, we believe, will greatly help the contractor in his financing problems.

Set up a tough, aggressive engineer at state level on the utility removal. Not a desk man, but a man who will ride the jobs, and see for himself what jobs are being delayed or contractors' operations slowed down by non-removal of utilities. Let him place the blame, require immediate correction, and better cooperation from the district utility engineer in the future.

Let's Pool Everyone's Ideas for Highway Concrete Work

The admitted lack of decisive advancement in concrete making and placing techniques in recent years, this author feels, is due to methods specifications, and the cumbersome task of getting individual state ratification of new and better methods. He proposes (1) greater use of the ready mix industry and (2) a central clearing house for new techniques and new ideas.

(Continued from page 95, Western Conference on Highway Engineering Productivity)

productivity of his concrete mixing and placing machinery. He said I didn't cooperate—and maybe I didn't. But I found out an important thing: that after I learned a little more about the proper application of the machinery, I had fewer complaints concerning my cooperation.

Later when I was in the machinery business, the contractors told me that "down time"—due to inadequate design, unavailable parts and poor service—was their greatest handicap to maximum productivity. The distributor, in reply, placed the blame on lack of cooperation from the contractor (preventive maintenance), and lack of cooperation from the engineers and inspectors.

This all indicates greater productivity can be obtained through improved cooperation. Therefore I believe more must be done to create better understanding between all concerned.

Functions performed by good distributors all cost money. Too often a distributor may fail to perform these functions because the buyer fails to take their value into consideration when he is placing his order, thereby encouraging the distributor to surrender, at that time, that portion of his compensation intended to reimburse him for the performance of these valuable services.

FUTURE FOR READY MIX

Discussing greater productivity of available concrete mixing and placing machinery, I would be remiss if I overlooked the tremendous potential existing in the ready mixed concrete industry. It consists of over 2,000 companies operating over 3,500 plants. Their investment in plant and equipment exceeds ¾ billion dollars.

Last year these plants produced enough concrete to pave about five times as many roads, streets and alleys as were paved in the nation. Many of them employ highly trained and experienced organizations including plant managers, concrete technicians and engineers. They placed high-quality concrete in all types of work including concrete paving. They are available, ready and willing to serve this industry.

Some of you may feel you would like greater assurance concerning the equipment or methods these suppliers use. If that be the case, tell them what you want—either individually or through their Ready Mixed Concrete Association in Washington and I feel sure that if it is economically feasible and good for their industry and ours they will give it to you.

How about new and improved concrete machinery? Why hasn't there been more of it in the last 20 years? The answer is purely an economic one, from both the standpoints of money and manpower.

There are drawings covering concrete machinery lying in many vaults which have never been put into production because the manufacturer, after a market analysis, knew he would never get even his promotional investment back. Data collected by the manufacturer's market research generally show: the potential market is (apparently) low. The cost of promoting acceptance by engineers and use by contractors is high.

METHOD AND RESULTS

In the concrete mixing and placing field, specifying bodies almost unanimously specify both methods and results. Before a contractor can use the new machine, the specifications must be changed or the specifying agency must approve. The manufacturer must obtain this approval and the process is very costly. This cost alone, in most cases, is far more than the manufacturer can hope to get back.

A quick example: A certain new machine will give the engineer the desired results. It will speed up pro-

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MACHINES CUTTING COSTS

(Continued from page 102)

Add to this picture of "too long in the cut" the fact that the real owning and operating costs of the machine with the larger load will be somewhat higher. It all adds up to: too long in the cut can mean a higher cost per cubic yard.

In addition to owning an easier loading scraper, the contractor can use a larger pusher, as pointed out previously. There is even some consideration being given to an electronic device to signal the hauling operator when he has reached the most economical load and/or loading time. Most of us have seen pushers equipped with horns, lights, flags, etc., in an attempt to get the haul unit out of the cut and on its way to the fill.

Conclusion: All of these developments are the result of the contractor demanding better balance in his spread, higher operator and machine efficiencies, less downtime —in short, *more production* at a *lower cost*. On the big job ahead, we will be hauling more dirt *farther* distances and in *less* time—and it will probably be done at a cost lower than in the past. All of this will be accomplished in the face of rising prices. The machines and methods just described will make this possible. The contractor who doesn't know or recognize these facts will not be helping on the job ahead because he won't be getting the bids.

WHY SHOULD CURBS COST 9 PERCENT OF WHOLE JOB?

Curb-and-gutter, such as will be used extensively in urban expressway and related work, affords an example of the price being paid for lack of standardization in paving work.

At the Los Angeles panel meeting on better use of equipment, a contractor singled out the lowly curb-and-gutter for comment. Joseph D. Bonness, of Jos. D. Bonness Co., Milwaukee, called for better design for curb-and-gutter as well as the grates used as curb inlets. "While this may seem to be more or less trivial," said Bonness, "we believe that with the advent of the construction of the Interstate system, there will develop a large quantity of typical urban sections, at least in and around metropolitan areas, which will necessitate expenditure of large sums of money in curb and gutter, inlets and catch basins.

"On one project amounting to $2,400,000 we found the curb and gutter costs came to $213,550, or about 9 per cent of the total contract. Where several municipalities are involved, it is found that each has its own conception of a curb-and-gutter design. In many instances each of these designs has been incorporated somewhere in the over-all project, thus requiring contractors to equip themselves with several different types of divider plates and face forms. This procedure gives rise to additional costs and certainly tends to slow down production.

"We also found in some metropolitan areas where outside engineering firms are called in to assist in design, that new types of casting specified are different only in minute detail from those successfully used by large municipalities for many years."

duction—will increase productivity of all personnel, and save the taxpayers a great deal of money. It is revolutionary in character.

The manufacturer is quite optimistic; he figures that, with one man's time for six months and one machine, he can get the approval of one specifying agency. Using the data collected in his market research department and by simple arithmetic, he figures he'd get his money back in approximately five months of sales.

Any manufacturer would certainly go ahead on this outlook. But there is a missing link. In order to sell the required number of machines to accomplish this, he must have the approval of *all* the specifying agencies and he has only *one*. But he won't give up. He decides, "if I get the approval of 24 states, all other agencies will follow." He figures the cost of 24 promotional efforts. And these figures show that to get back only his promotional investment would take eleven years.

IF HE WENT AHEAD?

What would you do? I'm sure the same thing the manufacturer did. He put the drawings in the vault.

But suppose he went ahead blindly without data or analysis. Some manufacturers do. How about the productive use of manpower? In one case—one man for six months; in the other—24 times as much manpower. Furthermore, 24 times as much manpower would be used up by the approving agency. That's not increasing the productivity of engineering talent.

How about the time element? We want speedy acceptance of new ideas, new concepts and new machines so they can work for us now. Past experience shows that even with almost unlimited manpower on the part of both manufacturer and specifying agency, acceptance on a national basis requires from three to five years. Can we wait that long?

The question may be asked, "suppose we specify results and say nothing of methods?"

I believe that specifying results only in concrete work is a goal for which to strive, but also that it is too dangerous for use on a broad scale at this time. With present testing techniques and equipment and because of the nature of concrete, it is practically impossible to ascertain just what results are being obtained at the time the product is being produced. The engineer must rely on methods known to be capable of producing the desired results. If the future brings forth new techniques and methods of testing which solve this problem, then specifying of results only will, with safety, contribute much to productivity in the concrete field.

So what is the conclusion? We must establish ways of increasing productivity of *available* machinery and equipment by fostering new and better methods. This can be done by setting up a central agency to make available factual, unbiased data on the application of our present machinery for whatever type of job might be at hand.

WORK OF AGENCY

This fact-gathering job would contribute to greater productivity by creating better understanding between manufacturer, distributor, contractor and engineer through these avenues:

(1) By encouraging the development of better distributor organizations and their more effective use.

(2) By encouraging greater use of the tremendous potential existing in the ready mix concrete industry.

A function of this central agency would be the quick approval or disapproval of new methods, ideas and concepts. This would bring better techniques out of hiding, would encourage the future development of additional new methods, including improved testing equipment and techniques which eventually might make it possible to safely specify results only—thereby solving, to a greater extent, the very complex, costly and time consuming problem of specification writing.

The speed with which such an agency is put into operation will determine, I believe, how soon the concrete mixing and placing field will contribute its full share to quality, cost reduction and increased highway productivity.

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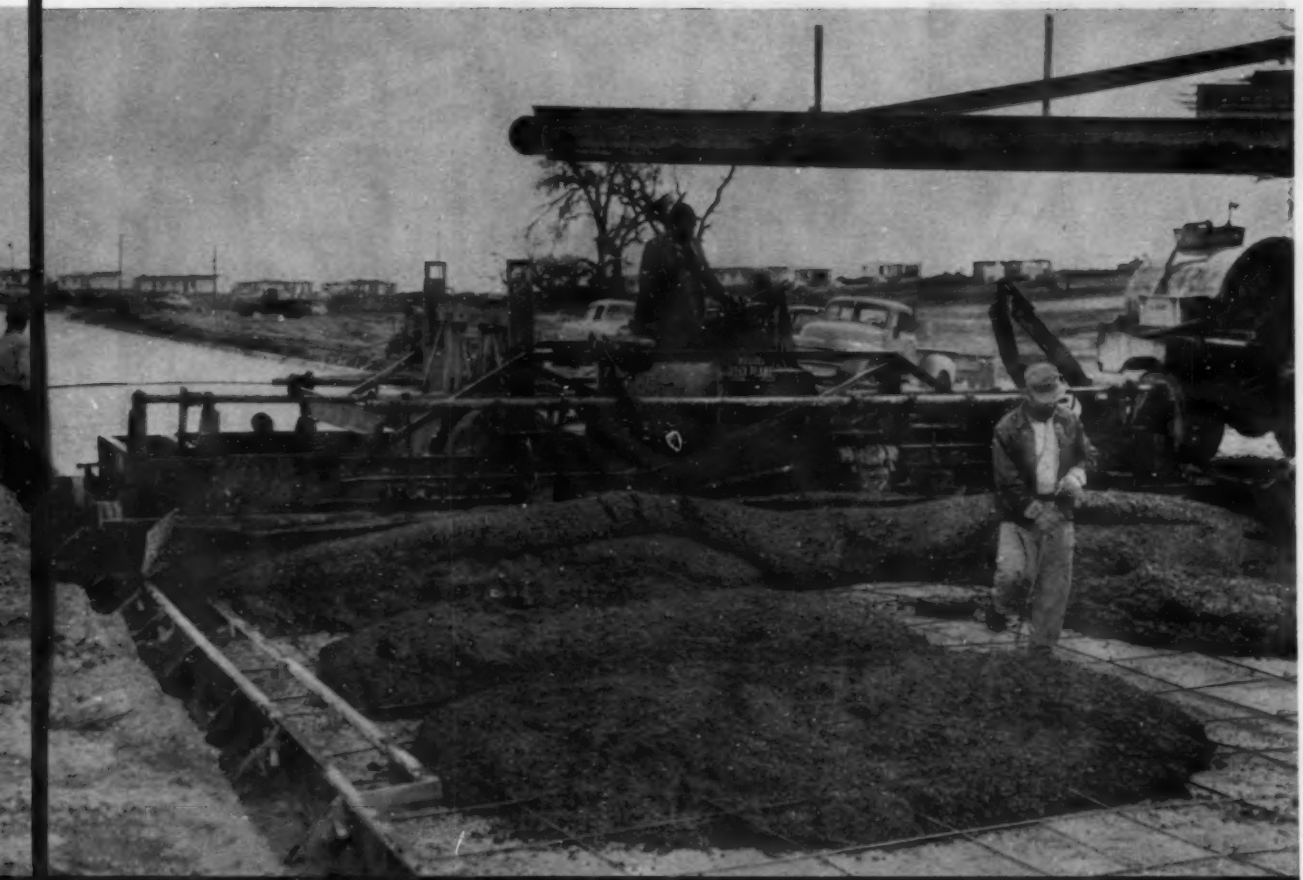

TEXAS CITY STREETS Contractor reported highest pouring ever. Credits Flex-Plane. Note amount of concrete in front of screed here.

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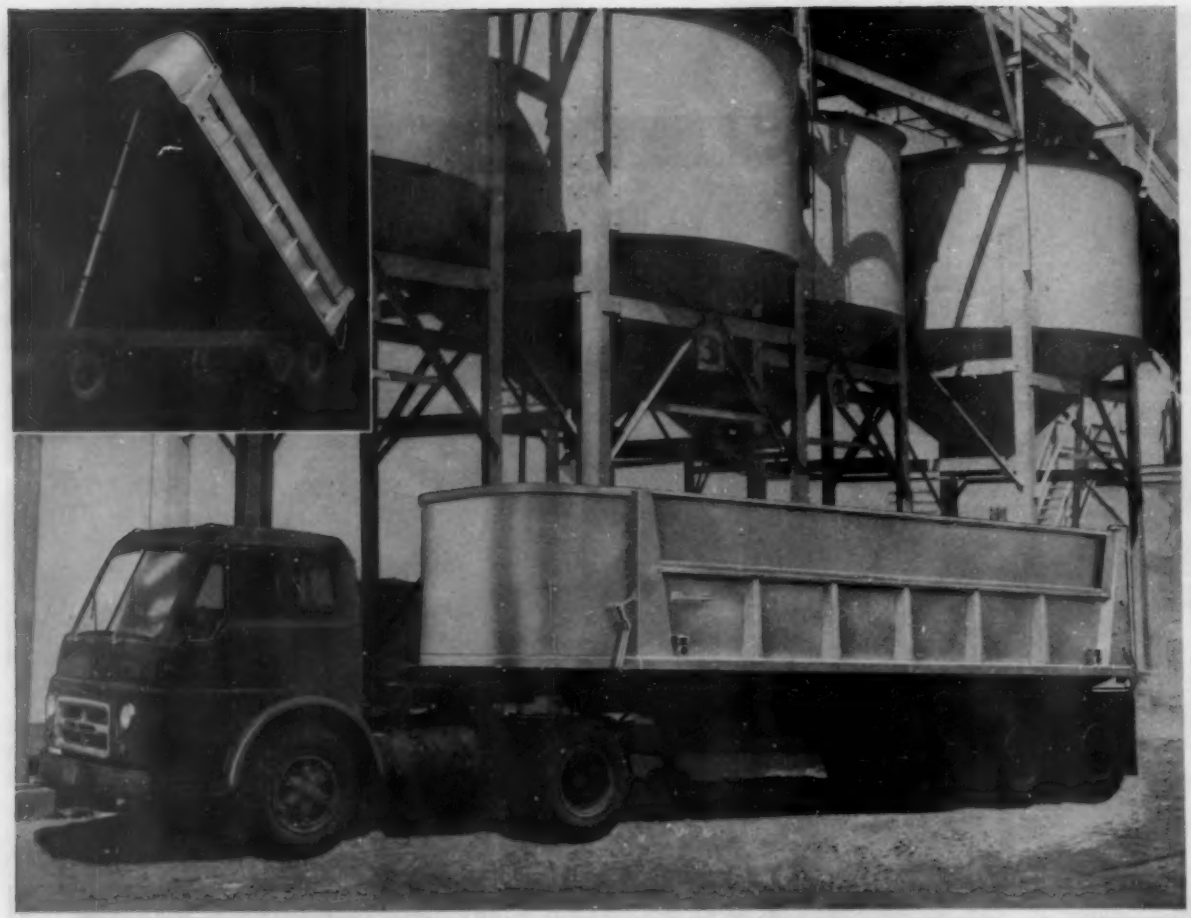

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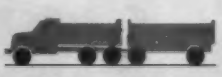

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. . . for more details circle 291, page 16

Detailed Design Procedure for a

Prestressed, Pre-Tensioned, Bonded Concrete Modified I-Beam and Composite Girder

Solution of a design problem typical of those which will confront many engineers, as prestressed concrete construction increases under the nation's expanding highway building program.

Prepared by V. J. BROWN, C.E., Editor of "Rural Roads," Gillette Publishing Company, from data by H. KENT PRESTON, Engineer, Construction Division, John A. Roebling's Sons Corporation.

Even before the expanded federal highway program was passed by Congress at the last session, bridge steel was on long delivery schedules, sometimes as much as 12 to 18 months. Today it seems advisable to many engineers that federal, state, and county road agencies use prestressed concrete for bridges to prevent construction delay, to say nothing of the economics involved. For instance, the City of Philadelphia took bids this past summer on a 7-span bridge of an over-all length of approximately 700 ft. The base design was structural steel but the specifications were so written that any contractor could submit any design in any material he chose, provided he met certain basic requirements. Three contractors submitted three different prestressed designs. All bids for prestressed designs were below the structural steel bid for approximately $200,000. It stands to reason that in order to prevent delays to the entire program, engineers should start these new designs before they have gone too far in their design work.

It is with the thought in mind of not delaying the highway program, plus the thought of saving construction funds, that the article herewith on the design of a prestressed, bonded, pretensioned concrete beam and girder is prepared. Since the publication of our last articles on prestressed concrete design, new criteria have developed from research and study, and consequently there have been some changes in the design procedure.

I am indebted to H. Kent Preston, Engineer, Construction Materials Division, John A. Roebling's Sons Corporation for the basic data from which this article was prepared. This company has pioneered prestressed concrete construction in this country using American methods.

I have tried to simplify the design method by using a step by step procedure. Many road engineers of the states and counties may have forgotten some of their structural design knowledge and it is hoped that this article will be of interest to them.

In preparing the article, reference has been made to the following information:

1. Data Sheet D49, sheets 1 to 13, inclusive of John A. Roebling's Sons Corporation.
2. Data sheet PC-921, John A. Roebling's Sons Corporation.
3. Catalog PC-929, John A. Roebling's Sons Corporation.
4. Criteria for Prestressed Concrete Bridges by the U.S. Bureau of Public Roads, dated 1954.
5. Standard Specifications for Highway Bridges by the American Association of State Highway Officials.
6. Specifications for Pre-tensioned Prestressed Concrete by Prestressed Concrete Institute, dated 1957.

—V. J. Brown, C.E.

It is anticipated that many new beam casting yards will be established to meet the demands of the new highway program.

• • •

Design of a prestressed bonded pre-tensioned concrete modified I-beam from which evolves a composite T-beam, is the starting point for the construction of a prestressed concrete bridge. From the design, estimates of construction cost are made for comparison with other types of design. Prestressed concrete bridges are economical and in many places

save headroom so badly needed at times.

Normally, the symbols to be used and what they mean are placed at the beginning of an article. In this article they have been placed at the end. Symbols are those used by engineers working with prestressed concrete design. This article is a step-by-step procedure for the design of a prestressed bonded pre-tensioned precast concrete I-beam and a composite T-beam, using 7-wire uncoated prestressed concrete strands, 5,000-lb. concrete in the precast member and 3,000-lb. concrete in the slab.

General Study

Prior to the actual design calculations the engineer will usually make a general study of the subject. As a result of this study he will adopt a cross-section as a trial and then start calculations. In this case the cross-section shown in figure 1 was adopted as a trial. Often, calculations will indicate where and how the cross-section must be changed before preliminary calculations have gone very far. Rather than go through this phase, the cross-section adopted, shown in figure 1, is that of a Type C beam of the Florida State Road Department, Bridge Division. In this case, thirty-six (36) ⅜-in. diameter strands have been substituted for the twenty-six (26) 7/16-in. strands shown on the Florida plans in order to conform with the criteria of the U.S. Bureau of Public Roads. These criteria limit strand diameter to maximum ⅜-in. size, however they have approved the use of 7/16-in. strands on some of the projects submitted to them where they felt its use was justified.

Detailed Procedure

● *First Step.* Determine the location of the center of gravity of the strands. Taking moments of the strand groups about the bottom of the beam we get:

16	× 3 in. =	48 in.
6	× 6 in. =	36 in.
4	× 8 in. =	32 in.
6	× 12 in. =	72 in.
2	× 22 in. =	44 in.
2	× 34 in. =	68 in.
Totals 36		300 in.

300 ÷ 36 = 8.33 in. which is distance above bottom of beam for center of gravity of steel. We can use this simple calculation because the areas of the cross-sections of the strands are all alike. If the areas were of different sizes we would have to compute the location of the center of gravity by using moments of inertia. Strands used are Roebling 7-wire, ⅜ in. diam., uncoated prestressed concrete strand as indicated on page 5 of Roebling Catalog PC-929. The minimum ultimate strength of this strand is 20,000 lb., the tensioning load is 14,000 lb.

For this beam, therefore, the initial prestress, F_i, equals 36 × 14,000 = 504,000 lb. The concrete in the beam must be 5,000-lb. concrete, i.e., the ultimate $f_c' = 5{,}000$ psi (pounds per square inch).

● *Second Step.* In order to determine the eccentricity of the strands, i.e., the distance between the center of gravity of the concrete section and the center of gravity of the steel, we must calculate the properties of the modified I-section. To do this we use the formula $I_x = Ay^2 + I_o$, where moments are taken about the x-axis, in this case the top of the beam. Ay^2 is easily calculated from the area and the lever arm y. I_o is obtained from the formulas for moment of inertia. For a rectangle the moment of inertia about its own center of gravity is $I_o = \frac{bd^3}{12}$ where b is the width of the particular area and d is the depth. For triangles, $I_o = \frac{bd^3}{36}$.

The accompanying table shows these properties with moments calculated about the top of the beam cross-section, figure 1.

The moment of inertia of the entire cross-section is the summation of the Ay^2 values plus the summation of the I_o values or indivdual area moments of inertia. This is by formula.

To get the location of the center of gravity of the concrete we divide Ay by A to get $\bar{y}^t$. $\bar{y}^t = 7443 \div 369 = 20.17$ in. distance from top. $\bar{y}^b = 36$ in. − 20.17 in. = 15.83 in. distance from the bottom of the beam.

To get the moment of inertia of the beam about its own center of gravity we subtract the product of the area times the square of $\bar{y}^t$ from I_x**. Thus, $I = 201{,}109 - 369\,(20.17)^2 = 50{,}989$.

The section modulus of the top and of the bottom fibers will be required, thus $Z^t = 50{,}989 \div 20.17 = 2{,}528$

$Z^b = 50{,}989 \div 15.83 = 3{,}221$

The weight per foot of beam = $W = \frac{369}{144} \times 1 \times 150 = 385$ pounds per foot, assuming concrete to weigh 150 lb. per cu. ft.

The eccentricity of strands is e = 15.83 in. − 8.33 in. = 7.5 in.

● *Third Step.* Now that we have the properties of the cross-section which we selected to check, the next step is to determine the stresses in the top and bottom fibers, and the final stress in the strands from the tensioning load allowed on the strands. The following formulas† are used to obtain stresses due to initial prestress F_i:

$f_{F_i}^t = \frac{F_i}{A} - \frac{eF_i}{Z^t}$ for stress at the top of the beam due to initial prestress.

$f_{F_i}^b = \frac{F_i}{A} + \frac{eF_i}{Z^b}$ for stress at the bottom of the beam due to initial prestress.

**This is also a formula derived by calculus and found in books on structures. We accept it without trying to prove it or reason why.

†Mr. H. Kent Preston says. "Wherever possible I like to work with calculations in which each item represents a specific stress or property of a section rather than just some numerical formula. For example, the formula for stress in the top fiber of a member due to the pre-stressing force is as follows:

$$ft = \frac{F}{A} - \frac{Fe}{Z^t}$$

"In the formula, $\frac{F}{A}$ is the uniform compressive stress due to the prestressing force, and $\frac{Fe}{Z^t}$ is the stress in the top due to the eccentricity of this force. Having these two values in front of us, we can easily decide the best procedure for obtaining a higher or lower top stress. An inspection of these two values shows immediately whether the proper procedure is to change the value of F or the value of e".

(Continued on page 119)

Dimensions of Area	Area (sq. in.)	y (in.)	Ay	Ay^2	I_o
12 × 6	72	3	216	648	216
2 × 3 × 3 × ½	9	7	63	441	4.5
6 × 24	144	18	2,592	46,656	6,912
2 × 6 × 6 × ½	36	28	1,008	28,224	72
18 × 6	108	33	3,564	117,612	324
Totals	369		7,443	193,581	7,528
			Add	7,528	
			I_x =	201,109	

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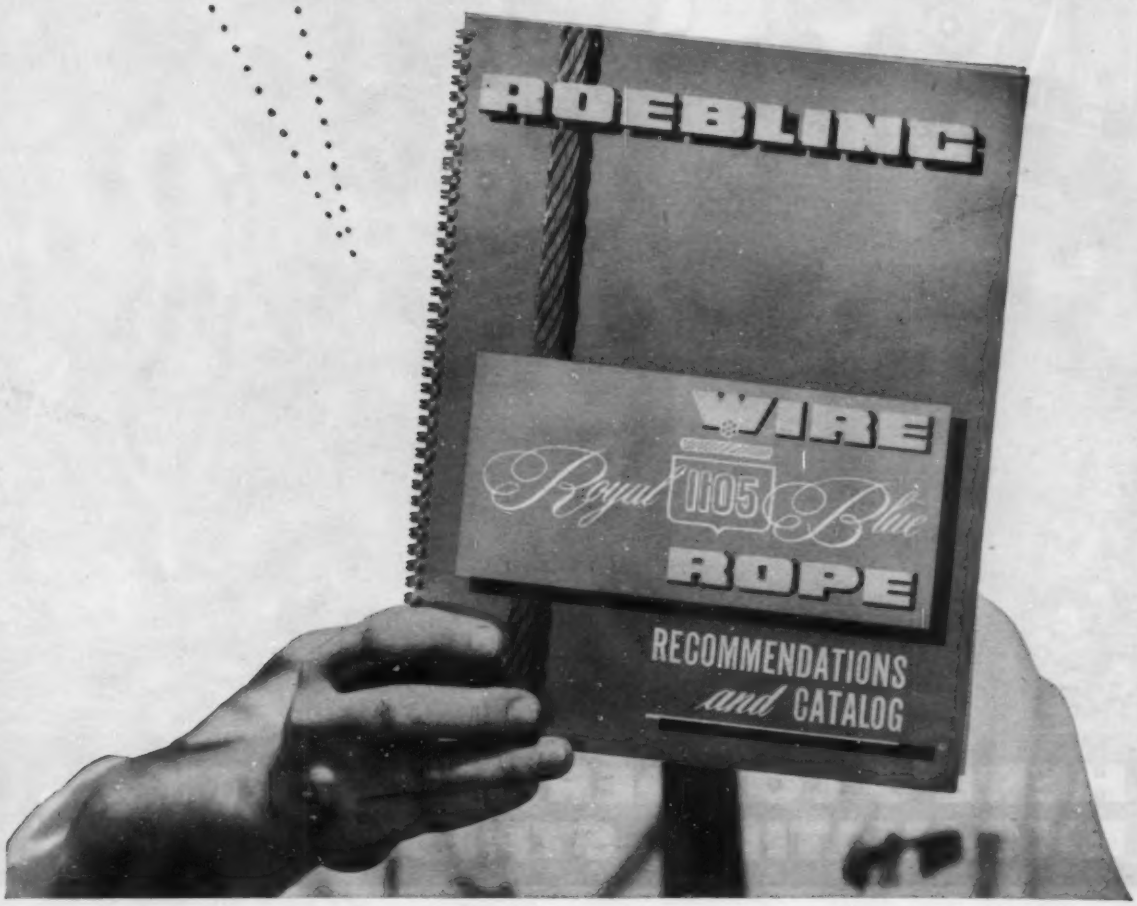

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. . for more details circle 237, page 16

ALLIS-CHALMERS *Engineering in Action*

(Continued from page 116)

$$f^b_{P_i} = \frac{504{,}000}{369} - \frac{7.5 \times 504{,}000}{2528}$$

(See step 1 for the 504,000 and step 2 for the other figure)

$= 1366 - 1495 = 129$ psi (tension)

$$f^b_{P_i} = 1366 + \frac{7.5 \times 504{,}000}{3221} = 1366$$

$+ 1174 = 2540$ psi (compression)

● *Fourth Step.* After concrete is prestressed, a gradual relaxation of stress takes place both in the steel and in the concrete. This decrease in prestress is understood to be due to creep, shrinkage, and elastic deformation. The Criteria for Prestressed Bridges published by the U.S. Bureau of Public Roads defines each of these conditions and establishes limits for each. For pre-tensioned, bonded, prestressed concrete the criterion for stress loss is $6{,}000 + 16f_{cs} + 0.04f_{si}$ which will be called f_Δ. We must calculate the symbols in the above criterion because the unit final stress in the pre-tensioned strands will be the unit initial prestress minus f_Δ.

To calculate f_{cs} let us refer to the Criteria of the U.S. Bureau of Public Roads, on pg. VI under "Notation" it says, "f_{cs} = concrete stress at the centroid of the prestressing steel. Where the stress varies from end to end of the beam it shall be taken as the average value (psi)". This factor comes into the calculations since it would be possible to create a given compressive stress in the bottom of a member by using different amount of prestressing steel and varying the eccentricity. The larger prestressing force would be located further from the bottom of the beam and would therefore be in an area where the concrete stress was lower with a resultant lower stress loss in the steel. Using this factor gives more accurate computations than we used to have when we simply said the stress loss shall be so many psi or when we said it shall be a certain percentage of the initial stress.

We must calculate the compressive stress at the centroid of the steel. Since 8.33 in. is the distance from the bottom of the girder to the centroid of the prestressing steel and 36 in. is the total depth of the beam, the decrease in stress is $\frac{8.33}{36}$ × total stress difference.

The figures are:

Total stress difference = $2540 - (-129) = 2669$.

The drop-off in stress as we move up to the centroid of the steel equals

$$\frac{8.33}{36} \times 2669 = 618 \text{ psi},$$

therefore,

$f_{cs} = 2540 - 618 = 1922$ psi.

$16f_{cs} = 1922 \times 16 = 30{,}750$ psi.

To calculate f_{si}, the unit initial pre-stress in the strands, we refer to page 5 of Roebling's catalog PC-929 and in the table find the tensioning load per strand is 14,000 pounds. The cross-sectional area of a strand is 0.0799 sq. in.

$f_{si} = 14{,}000 \div 0.0799$
$= 175{,}200$ psi.

$0.04f_{si} = 0.04 \times 175{,}200$
$= 7{,}000$ psi.

With the results of the symbols at hand we now calculate the stress loss, thus:

$f_\Delta = 6{,}000 + 30{,}750 + 7{,}000$
$= 43{,}750$ psi.

The final unit stress we can use then is $175{,}200 - 43{,}750 = 131{,}450$ psi., and the final tension, F, will be $131{,}450 \times 36 \times 0.0799 = 378{,}100$ pounds.

● *Fifth Step.* The stresses in the top and bottom fibers of the girder due to the final prestress are: For the top fibers,

$$f^t_F = \frac{378{,}100}{369} - \frac{7.50 \times 378{,}100}{2528}$$

$= 1025 - 1122 = -97$ psi.

The subscript F above indicates that the stress is the final stress after creep and elastic compression have been taken out.

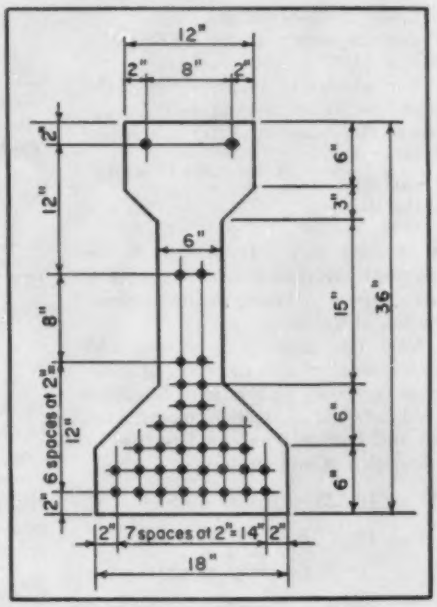
For bottom fibers, $f^b_F =$

$$\frac{378{,}100}{369} + \frac{7.50 \times 378{,}100}{3221}$$

$= 1025 + 880 = 1905$ psi.

Composite Section

● *Sixth Step.* Since this beam or girder is to be used in connection with and part of a bridge floor, a 4-ft. portion of the floor which is tied to the beam with the hooked ends of stirrups, can be considered as the cross bar of a composite T-beam as shown by figure 2. That is to say, we can assume that the girders will be spaced at 4-ft. centers. In which case, 48 in. of the floor will constitute the cross bar of a composite T-beam.



● **Fig. 1. Cross-section of I-beam adopted for study contains thirty-six 7-wire stress-relieved Roebling prestressed strands of ⅜ in. diameter. The allowable minimum ultimate strength is 20,000 pounds (20 kips) per strand.**

In most bridges of this type the concrete in the girder will have a higher ultimate strength than the concrete in the slab poured over it. Some designers feel that the difference in modulus of elasticity, E, between the slab and the girder should be considered in computing properties of the composite section. Others use the entire cross-section as if it were composed of the same material. In checking the properties of the composite section the conservative approach will be used in these calculations and the difference in E will be considered.

For the slab, let $f'_c = 3{,}000$ psi.

For the girder, $f'_c = 5{,}000$ psi.

$E_c = 1{,}800{,}000 + 400f'_c$ (Accepted formula).

For the slab, $E_c = 1{,}800{,}000 + 400$

$\times$ 3,000 = 3,000,000 psi.

For the girder, E_c = 1,800,000 + 400 $\times$ 5,000 = 3,800,000 psi.

For calculating the properties of the composite beam, a ratio must be applied to the concrete of the slab, hence $\frac{3{,}000{,}000}{3{,}800{,}000} = 0.79$, the ratio to apply to the slab.

● *Seventh Step.* Properties of the composite section shown by figure 2 are obtained by taking moments about the top of the slab.

Now the distance from top and from bottom of slab to center of gravity of composite section must be calculated, as well as section modulus of top and bottom fibers for later use in calculation of unit stresses.

$\bar{y}^t$ = 10,525 ÷ 625 = 16.84 in.

$\bar{y}^b$ = 42 − 16.84 = 25.16 in.

I_c = 307,650 − 625 (16.84)²

= 307,650 − 177,250 = 130,400

Z^t = 130,400 ÷ 16.84 = 7,743

Z^b = 130,400 ÷ 25.16 = 5,183

W (weight) =

$\left\{[(227.5 + 28.5) \div 0.79] + 369\right\}$

PROPERTIES OF COMPOSITE SECTION

Dimensions of Area (in.)	Area (sq. in.)	y (in.)	Ay	Ay^2	I_o
.79 × 48 × 6	227.5	3	683	2,048	682
.79 × 36 × 1	28.5	6.5	185	1,204	3
Girder	369.0	26.17*	9,657	252,724	50,989**
	625		10,525	255,976	51,674
				51,674	
				307,650	

*Distance from center of gravity of concrete in girder to top of composite beam.

**I of girder about its own center of gravity. See second step.

$\times \frac{150}{144}$ = 722 lb. per ft. The areas in parenthesis were divided by 0.79 because they had previously been reduced by that amount for calculating properties of the section. The 144 changes square inches to square feet because 150 is weight of concrete per cubic foot.

e − There is no need to calculate e because we are not interested in the prestressing of the steel now.

Next we must calculate the ratio of the unit stress in the top of the slab (top fiber) under composite action to that in the top fiber of the girder. There are two locations of critical stress, the bottom of the girder and the top of the girder. The stress in the bottom of the girder is found directly from computations. The stress in the top of the girder is less than in the top of the slab. Since the computations give the stress in the top of the slab, we need the ratio to obtain the stress in the top of the girder.

The compressive stress in the top of the girder is the highest compressive stress in the structure because the girder alone carries its own dead weight plus the weight of the slab. In addition, it helps to carry the live load by composite action. f_{co}^t (top of girder) $= \left(\frac{16.84\text{-}6}{16.84}\right) \div 0.79 = 81.5\%$ f_{si}^t

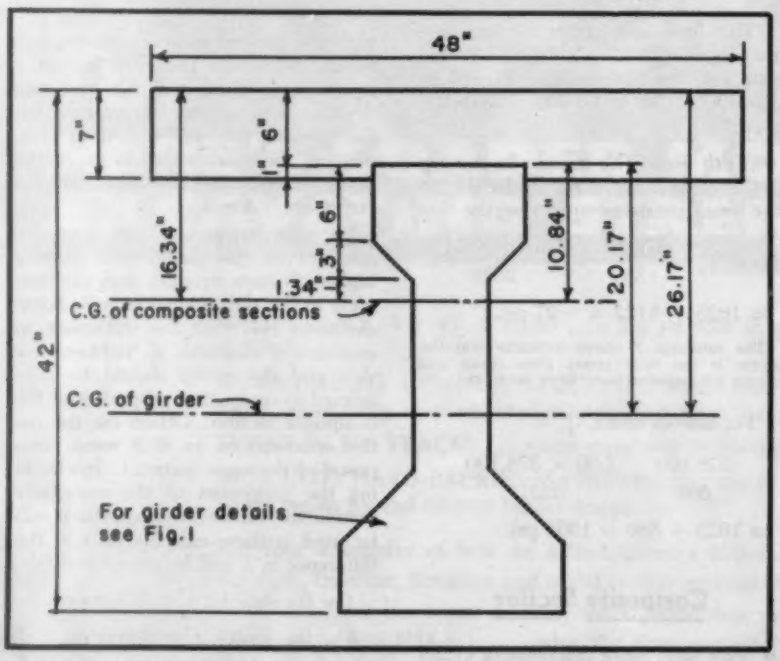
Note: Since the unit stress variation in the concrete from the top of the slab to the center of gravity of the composite girder is uniform under load, the ratio of unit stress in top of slab to unit stress at top of girder (a little lower down) is a straight line ratio. Also, since the center of gravity had been calculated on a reduced area basis, the ratio had to be increased by the amount (0.79) that the areas had been reduced in calculating the properties of the section.

● *Eighth Step.* We must now check the stresses in our assumed cross-sections for an assumed span, and we adopt a 52 ft. span, center to center of bearing, and use the H20-S16 loading. Dead and live load moments and impact must be calculated. From the equation $M = \frac{WL^2}{8}$ we get the dead load bending moment:

$$M_{DL} = \frac{722 \times (52)^2 \times 12}{8} =$$

2,928,432 in.-lb. We multiplied by 12 to convert ft.-lb. to in.-lb.

Since the entire dead load of the girder and slab is carried by the girder alone, dead load unit stresses must be calculated by dividing the bending moment by the beam section modulus.



● **Fig. 2. Cross-section of an assumed composite T-beam made out of the girder plus floor, from midway between girders, and the I-beam. Girders spaced 4 ft. 0 in., c. to c.**

In this case, for the top fibers;

$$f^t_{DL} = \frac{M_{DL}}{Z^t} = \frac{2{,}928{,}432}{2528}$$
$$= +1158 \text{ psi.}$$

For the bottom fibers,

$$f^b_{DL} = \frac{2{,}928{,}432}{3221} = -909 \text{ psi.}$$

These figures will be used later in a summation of stresses.

To check the stresses due to live load, we first must get the live load. For this refer to the AASHO specifications, pg. 241. Lane live load M = 663.6 ft.-kips (a kip = 1000 lb.). Since this does not include impact, the latter must be added as a percentage of the live load. The formula for impact is $\frac{50}{L + 125} = \frac{50}{52 + 125}$ = 28.25%.

Live load M per 4 ft. 0 in. width is M_L and is reasoned as follows: The lane width live load is reduced to inch-pounds by multiplying by 1000 and then by 12. Impact is added by multiplying this by 1.2825. From table on page 138 of the AASHO specifications it is noted that for concrete stringers (girders) on a bridge of two or more traffic lanes, the fraction of the wheel load to each stringer is $\frac{S}{5.0}$, where S is the spacing of the girders. In this case, it is $\frac{4}{5}$* and is inserted into the moment calculation. Since a lane width carries both wheels of front and rear axles, to get a wheel load we must divide the lane load by two or multiply by ½.

Now the calculations;

$$M_L = 663.6 \times 1000 \times 12 \times 1.2825 \times \frac{4}{5} \times \tfrac{1}{2} = 4{,}085{,}122 \text{ in.-lb.}$$

With this and referring back to the section modulus calculations of the composite girder we calculate the live load unit stresses in the top fiber of the slab, the top fiber of the beam and the bottom fiber of the beam, thus;

f^t_{sl} = 4,085,122 ÷ 7,743 = + 526 psi.

f^b_{co} = 81.5% of 526 = 429 psi.

f^t_{sl} = 4,085,122 ÷ 5183 = − 788 psi.

We are now ready for a summation of stresses:

	Top—psi.	Bottom—psi.
DL (dead load)	1158	− 909
LL (live load)	429	− 788
	1587	−1697
Prestress	−97	+1905
Net stresses in girder	+1490	+208

Checking a beam requires a calculation of the final stresses in the girder at the supports, or piers. The only ones in this case are due to F and they are f^t_F = − 97 psi and f^b_F = + 1905 psi.

Recheck Longer Span

● *Ninth Step.* The results of the summation of stresses show a residual compression of 208 psi., while the specifications permit this stress to drop to zero. If our span length had to stay at 52 ft. 0 in., we would refigure the bridge with the girders spaced further apart, perhaps 4 ft. 6 in. c. to c. instead of 4 ft. 0 in. However, if increasing the span length would be advantageous, we would refigure using girders at 4 ft. 0 in. and determine stresses for a longer span.

As a last alternative, the cross-section could be revised if the span length had to remain fixed and the girders had to be spaced on 4 ft. centers.

So let us try a longer span, say 56 ft. 0 in. and check the stresses.

● *Tenth Step.* Following the previous procedure we have

$$M_{DL} = \frac{722 \times (56)^2 \times 12}{8}$$
$$= 3{,}396{,}288 \text{ in.-lb.}$$

$f^t_{DL} = M_{DL} \div 2528 = +1343$ psi.

$f^b_{DL} = M_{DL} \div 3221 = -1504$ psi.

Lane load moment, M = 735.1 ft.-kips.

$$\text{Impact} = \frac{50}{56 + 125} = 27.6\%$$

$$M_L = 735.1 \times 1000 \times 12 \times 1.276 \times \frac{4}{5} \times \tfrac{1}{2} = 4{,}502{,}340 \text{ in.-lb.}$$

$f^t_L = (M_L \div 7743) \times 81.5\% = 581 \times 0.815 = +474$ psi.

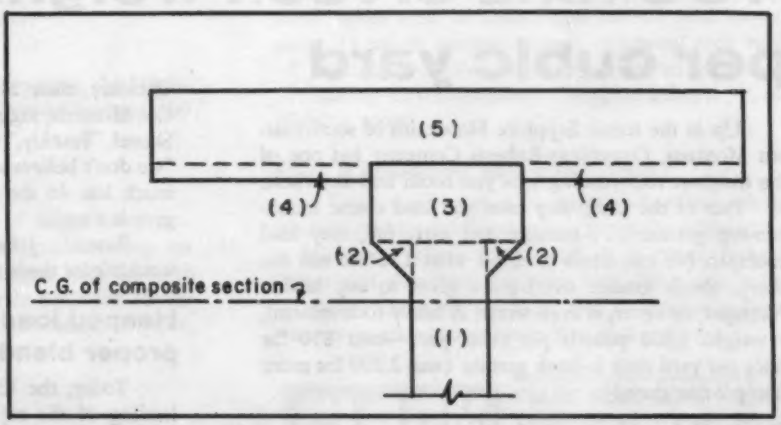
$f^b_L = M_L \div 5183 = -869$ psi.

SUMMATION OF STRESSES

	Top—psi.	Bottom—psi.
Dead load	1343	− 1045
Live load	474	− 869
	+ 1817	− 1923
f_F	− 97	+ 1905
Net	+ 1720	− 18

Another recalculation would show

(Continued on page 124)



● **Fig. 3. Numbered areas of figure 2, showing which areas are involved in calculations in the table.**

*The AASHO formula behind the table on page 138 of their standard Specifications (1949) gives no consideration to the fact some two lane bridges have 6 girders at 4 ft. centers, whereas others have only 5 girders at 4 ft. centers. They assume that the bending moment in any girder is a function of the girder spacing only, except that they recognize that the total dead plus live load moment divided by the number of girders must not exceed the moment used in designing the girder.

This reasoning indicates that the most economic design contains only 5 girders for a 2-lane bridge.

High altitudes, narrow benches severely test this Michigan, yet every day it loads

400 tons of rock weighing 5,400 lbs per cubic yard

Up in the scenic Sapphire Mountains of southwestern Montana, Cummings-Roberts Company has one of the toughest rock-loading jobs you could find anywhere.

Part of the time, they blast and load coarse mountain-top granite . . . summer and early fall, they load fluorspar. No one needs to detail what a severe test the heavy, rough granite overburden gives to *any* loader. Fluorspar, however, is even worse. A heavy rock mineral, it weighs 5,400 pounds per cubic yard—over 850 lbs more per yard than in-bank granite (and 2,200 lbs more than pit-run gravel).

Proved by demonstration

Over the years, Cummings-Roberts has tried just about every kind of loader made. Last year to increase efficiency, their Michigan distributor, Miller Machinery Co., Missoula, suggested a Model 175A Michigan Tractor Shovel. "Frankly," Cummings-Roberts officials told them, "we don't believe *any* rubber-tire unit can load the stuff, much less do the work day in and day out. But we'll give it a try."

Result? John Taber, General Superintendent, wouldn't let them take the Michigan off the job.

Heaped loading assures proper blending

Today, the 133 hp 2¾ yard Michigan handles *all* loading of the super-heavy fluorspar. Production, with trucks on 600 ft one-way hauls to crushing mill, averages 400 tons per 7-hour day. The fluorspar, incidentally, varies considerably in grade from place to place through-

out the mine. It must be blended to give the grade desired for shipment . . . and this assignment goes to the Michigan, too. Its 27 mph mobility is a vital asset on this scattered loading; trucks never wait more than a few minutes for loading service.

Strips granite overburden — 500 tons per day!

In late autumn and sometimes in spring, the Michigan strips the granite overburden. Output averages *500 tons* per 7-hour day.

Downtime negligible

With all this rugged loading of super-heavy material, plus repeated back-and-forth maneuvering on narrow benches, plus continuous work at high 6,800 to 7,000 ft altitudes, the torque converter equipped Michigan has posted an excellent mechanical record. *To date, it has had only one minor breakdown!*

Also tows compressors, speeds other odd jobs

Operator Don Lindblom likes Michigan's power-shift transmission, says its bucket action is the best he's ever worked with. "You can tip it back and fill it easily," he says. "I like the fact also that it takes only half-an-hour per day to refuel and lubricate." Foreman Waino Lindblom adds, "The Michigan has done a nice job for us! We particularly like its truck-like speed in moving from bench to bench." This mobility gives the Michigan some "spare time" to handle maintenance jobs scattered along 15 mi of mountain roads—cleaning rock rubble off benches so trucks and wagon drills can get through . . . hauling air compressors . . . digging culverts . . . even plowing snow.

. . . for more details circle 261, page 16

Got a tougher job than this?

There *may* be a tougher materials-handling job than loading granite and fluorspar . . . but we're willing to bet a Michigan Tractor Shovel can do it faster, better, at lower cost than any other machine. To prove it, your Michigan Distributor will be glad to arrange a demonstration at *your* convenience. *You pick the jobs.*

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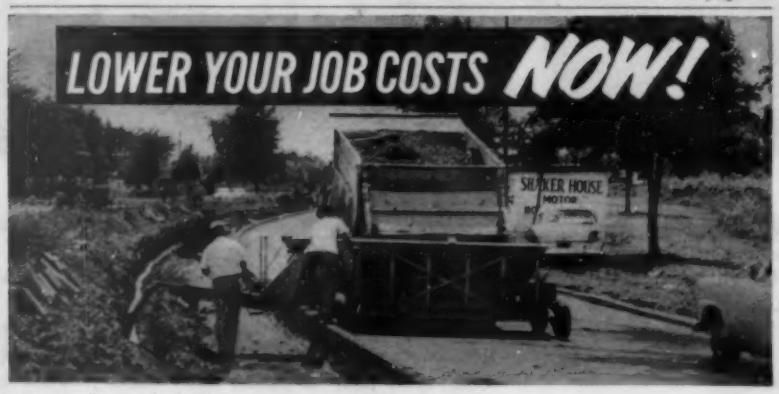

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PRESTRESSED DESIGN

(Continued from page 121)

that the maximum span for girders at 4 ft. 0 in. centers is about 55 ft. 10 in. in order to eliminate the tensile stress in the bottom of the beam.

For simplicity, we will check shear, and other criteria on the basis of a 56 ft. 0 in. span.

• *Eleventh Step.* Check ultimate strength according to pg. 2 of U.S.B.P.R. criteria,

$$p_b = 0.23 \frac{0.8 f'_c}{f'_s} = 0.23 \times \frac{0.8 \times 3.000}{250,000} = 0.00221$$

$$p = \frac{a_s}{bd} = \frac{0.0799 \times 36}{48^* \times (26.17 + 7.50)} = 0.00178$$

$a_s = 0.0799 \times 36$; $f'_s = 250,000$; $d = 33.67$; hence, for this beam $m_u = 24,212,097$ in.-lb.

According to criteria, the required ultimate bending moment is (a) $M_{DL} + 3\ M^{**}_L$ or (b), $2\ (M_{DL} + M^{**}_L)$.

Required ultimate strength in bending, (a) above
= 3,396,288 + 3 (4,502,340)
= 16,903,308 in.-lb. (O.K. since less than m_u)

Required ultimate strength in bending, (b) above
= 2 (3,396,288 + 4,502,340)
= 15,797,256 in.-lb. (O.K. since less than m_u)

Next, check the ultimate strength in shear. The principal tensile stress, s_t, is diagonal tension. It is calculated from the horizontal shear. This stress should be checked on the center of gravity of the concrete section which is usually the point of greatest shear. This point in a simple span is at the supports. If this computed tension stress is greater than $0.03 f'_c$ (ultimate strength of concrete) then provide stirrups to take the entire shear. If this stress is less than the allowable, no stirrups are required, although most designers use small diameter rods spaced one-half of the beam depth apart, or they use wire fabric. To find horizontal shear and the diagonal tension, use the following formulas:

$$v \text{ (unit horizontal shear)} = \frac{V}{L_c j} \quad a' \overline{y}$$

(See nomenclature for meaning of letters.)

*See page 17, line 12 of U.S.B.P.R. Criteria for reasons for choosing b = 48", p is less than p_b so use formula, $m_u = 0.9\ a_s f_s d$.

**M_L must include impact.

PRESTRESSED DESIGN PROCEDURE — Symbolism Used in the Problem

a_s = Area of steel (sq. in.)

$a'\bar{y}$ = Area (a') above the point under consideration times the distance ($\bar{y}$) from the neutral axis to the center of gravity of that area.

A = Cross-sectional area of concrete member.

b = Average width of the compression area (in.), assuming $k = 0.23$.

d = Depth of section from the compression face to the centroid of the steel (in.)

D = Dead load in pounds.

e = Eccentricity of application of prestressing force, i.e., distance from center of gravity of concrete cross-section to center of gravity of prestressing steel at point on span where stresses are being considered.

E_c = Modulus of elasticity of concrete (psi).

E_s = Modulus of elasticity of steel (psi).

f_Δ = Stress loss in prestressing due to creep, shrinkage, and elastic deformation.

f'_c = Ultimate strength of concrete (psi).

f'_s = Unit ultimate stress in the prestressing steel.

f'_t = Horizontal stress at point under consideration. Since prestressed concrete is not allowed to go into tension, f'_t is always a compressive stress.

f'_{co} = Stress at top edge of girder under composite action (psi).

f_{cs} = Concrete stress at the centroid of the prestressing steel. Where the stress varies from end to end of the beam it shall be taken as the average value (psi).

f^b_{DL} = Unit dead load stress in bottom fibers of beam.

f^t_{DL} = Unit dead load in bottom fibers of beam.

f^t_F and f^b_F = Unit stresses in top and bottom fibers due to final prestress.

$f^t_{F_i}$ and $f^b_{F_i}$ = Stresses in top and bottom fibers due to F_i only.

F = Total final tension in prestressing steel after plastic flow and shrinkage of concrete.

F_i = Total initial tension in prestressing steel.

I = Moment of inertia of whole area, also Impact.

I_o = Moment of inertia of individual areas about own center of gravity.

I_c = Moment of inertia of entire section about center of gravity of concrete.

I_x = Moment of inertia of entire section about the x-axis.

k = Depth from extreme compressive fiber to neutral axis divided by the effective depth d.

K = Kip (1000 lb.)

L = Span length in feet.

Ll = Live load.

m_u = Ultimate moment (in.-lb.)

M_{DL} = Dead load bending moment.

M_L = Live load bending moment.

$p = \frac{a_s}{bd}$

p_b = Value of p for a balanced section $= \frac{a_{bs}}{bd}$

psi = Pounds per square inch.

s_t = Principal tensile stress or diagonal stress in beam (psi).

t = Thickness of section at point under consideration.

v = Horizontal shear as computed by formula, $v = \frac{V}{I_c\, t} \times a'\bar{y}$

V = Total shear in beam due to dead and live loads (lb.)

W = Weight of the beam per foot of length.

y = Moment arm.

$\bar{y}$ = Distance from neutral axis to the center of gravity of the area.

$\bar{y}^t$ = Distance from top of beam to center of gravity of concrete.

$\bar{y}^b$ = Distance from bottom of beam to center of gravity of concrete.

Z^b = Section modulus of bottom of beam.

Z^t = Section modulus of top of beam.

$$s_t = \frac{f'_t}{2} - \sqrt{(v)^2 + \left(\frac{f'_t}{2}\right)^2}$$

First, however we must determine V. For a 56 ft. 0 in. span, ultimate shear, $V_{ult} = D + 3(Ll + I)$, or $2(D + Ll + I)$, in which I is impact.

$V_D = \frac{56}{2} \times 722$ (lb. per ft. of composite section) $= 20.2K$, which we substitute for D.

In order to get the lane live load in lb. to use for Ll in the formula, we refer to page 241 of the 1949 edition of AASHO Standard Specifications. Shear for a lane width of a 56 ft. span is $60K$. We multiply this by ½ to convert it into a wheel load shear. Hence for the second half of the equation we have:

(Continued on page 132)

IN 1907—First International motor truck was an "Auto Wagon." High-wheeler was designed especially to travel rutted, muddy farm-to-market roads. Its 20 hp air-cooled engine was of two-cylinder, four-cycle design. Recommended top speed was 20 mph.

TODAY— Truck-type V-8 engines were offered for heavy-duty International trucks in 1956 in 206, 226 and 257 hp ratings. New engines were laboratory-tested for 30,000 hours, road tested for more than 1,000,000 miles to assure outstanding performance.

International Trucks Celebrate 50th Year

It was in 1907 that a high-wheeled, two-cylinder "Auto Wagon" first bounced over the rutted roads and put International Harvester Company in the motor truck business.

Today International Harvester produces the world's most complete line of motor trucks, from pickup models of 4,200 lb. gross vehicle weight—to giant off-highway haulers rated at 96,000 lb. GVW. Of the 2,610,441 Internationals built during the 1907-1956 period, more than 1,100,000 are in use. For the past 25 years, International has been national sales leader in heavy-duty trucks, and has led in six-wheel truck sales for 22 straight years.

It was the U.S. Army's use of trucks in World War I that gave the trucking industry its first big boost. It was the sale of left-over, surplus wartime units that spearheaded the first national adoption of trucking.

Today International's Fort Wayne works is the world's largest single plant devoted exclusively to the manufacture of heavy-duty motor trucks. The specialization practiced at the Fort Wayne works is unmatched. International heavy-duty trucks are built "from the ground up" to meet specific hauling requirements.

> Truck maker thumbs through memory book, points to record 165,000 trucks in one year, 42 percent of vehicles built since 1907 still in use.

International, which in 1948 produced a record 165,600 trucks, in 1949 introduced the L-line consisting of 87 basic chassis models. In 1952 the company opened its large and complete truck engineering building and laboratory in Fort Wayne, the largest of its kind dedicated solely to truck development.

Next came the R-line, which carried specialization still further, with 168 basic chassis models in 296 wheelbases. Then in 1952, a first in truck history: International offered Underwriters-listed, factory-installed liquified-petroleum-gas-powered engines. The S-line of light, medium and heavy-duty trucks came in 1955, including a complete range of four- and six-wheel gasoline and LPG powered trucks. Four-wheel drive trucks were also added; and automatic transmissions, power brakes and power steering were made available. A series of powerful six-wheel-drive trucks was announced.

In 1956, the company unwrapped its V-line trucks, featuring three new V-8 truck-type engines, designed and built specifically for heavy duty and subjected to one million miles of tests at the company's Phoenix proving grounds.

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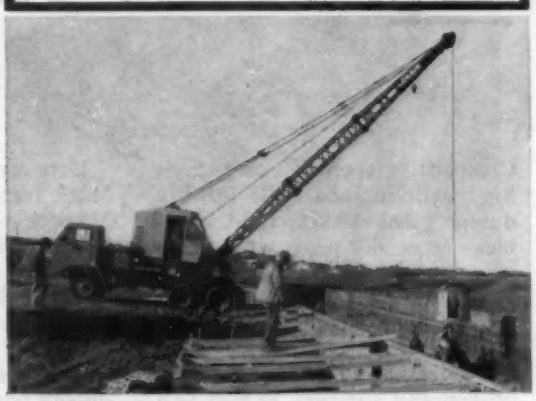

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Here are some of the exclusive Mack features—wide selection of Mack or stock diesels ranging from 170 to 400 hp, each delivering maximum torque at low r.p.m. . . . superior Mack transmissions with two-speed compound or torque converter . . . planetary gear reduction in rear-axle wheel hubs for smooth power transfer without excessively large gears in the carriers . . . the exclusive Mack Balanced Bogie with Power Divider, the four-wheel, rear-axle drive that delivers maximum power to the wheels with traction . . . many models available from stock, the units you want with the engines and transmissions or converters you need supplied upon gratifyingly short notice.

Why not investigate the large-capacity economy afforded by the complete line of Mack off-highway dumpers? Invite your Mack representative to give you full details and specifications. Mack Trucks, Inc., Plainfield, New Jersey. In Canada: Mack Trucks of Canada, Ltd.

4568

MACK
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TRUCKS

. . . for more details circle 302, page 16

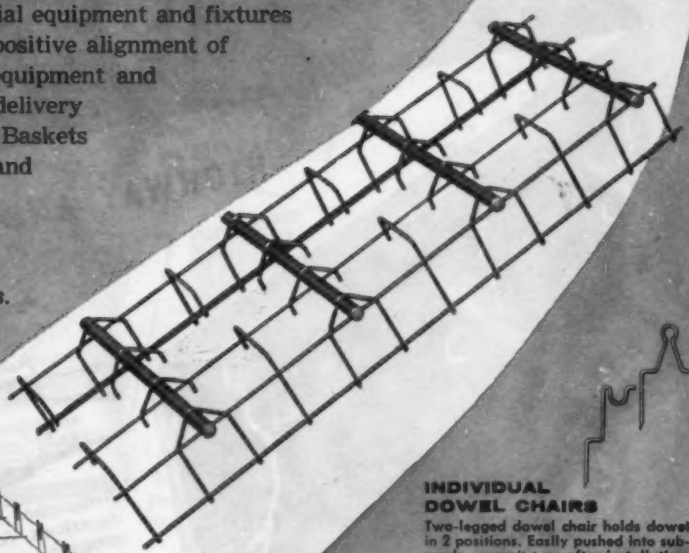
UNIVERSAL PRODUCTS
for highway construction

DOWEL BASKET ASSEMBLIES

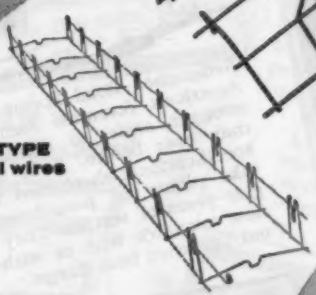
Universal Dowel Basket Assemblies are designed and fabricated to specifications. Special equipment and fixtures guarantee accurate spacing and positive alignment of dowels. High speed production equipment and modern facilities insure prompt delivery of your requirements. Universal Baskets are approved by Federal, State and private authorities for highway and airport construction.

Let us quote on your requirements. Write for complete details today.

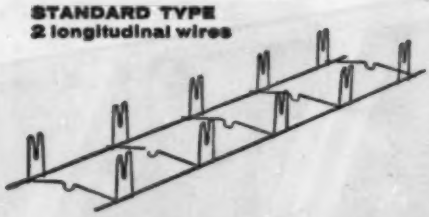
HEAVY DUTY TYPE
Maximum strength and support



STANDARD TYPE
4 longitudinal wires



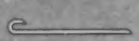
STANDARD TYPE
2 longitudinal wires



INDIVIDUAL DOWEL CHAIRS

Two-legged dowel chair holds dowel in 2 positions. Easily pushed into sub-grade — won't turn after installation. Wide range of heights.

Single Leg Dowel Chair permits quick snap-in of Dowel. Sizes to support Dowel from 3" to 6" above sub-grade.



STAKE PINS

Keep Dowel Bar Assemblies in place during the pour. Lengths from 4" to 15" in ¼" increments.

DOWEL SLEEVES

Metal Dowel Sleeves for covering ¾" Dowel Bars; overall length covers 2½" or 3" Dowel. Special sizes and lengths available.

HOOK BOLT ASSEMBLY

For providing required tieing element along longitudinal joint. Eliminates necessity of bending tie bars or drilling road forms.

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. . . for more details circle 337, page 16

Here's the greatest Steel ....ever offered!!

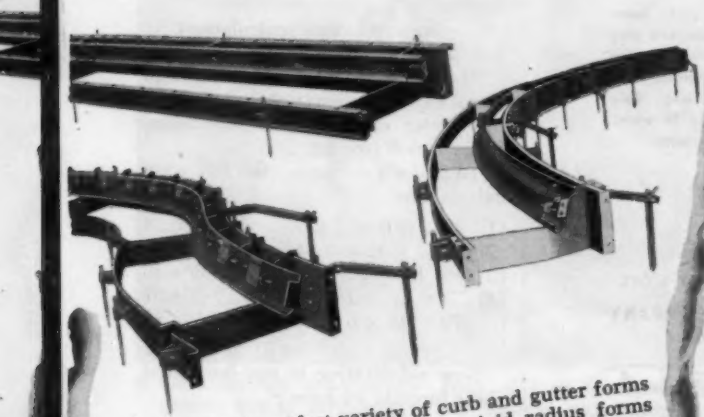
HIGHWAY AND AIRPORT FORMS

Redesigned Road Forms engineered by America's foremost form builder, are stronger, easier to align, faster setting than ever before. Built to contractors specifications, these new forms will take plenty of punishment and give years of service. They are now available with or without upturned base flange.

Heltzel's husky Dual Duty Forms have long been the favorites of contractors who build airport runways and ramps. These forms come in a number of double faces to enable contractors to pour two slab thicknesses with the same form.

Form Value

CURB AND GUTTER FORMS



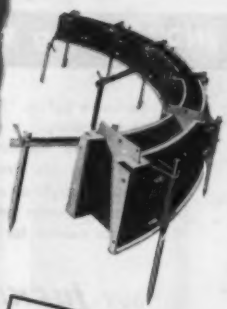
Heltzel builds the widest variety of curb and gutter forms in the industry. Straight, flexible or rigid radius forms for any face and style. You'll want to know about the combined curb and gutter forms with the interchangeable sections that permit many styles from the same basic set . . . a real cost saver!

SIDEWALK FORMS

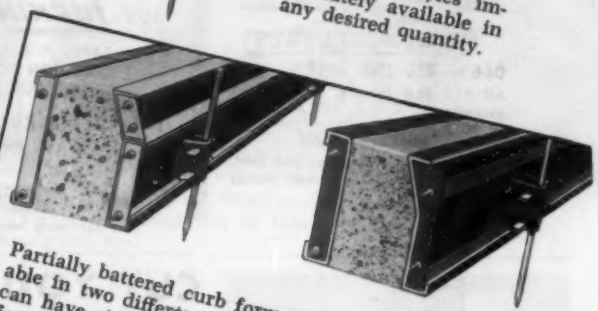
Here's an improved design sidewalk form with built-in Heltzel quality that assures lifetime performance. Division plate slots are spaced in one foot increments for better pouring practice.

CURB FORMS

Heltzel Curb Forms now have full length stake pockets that add to form rigidity—make staking faster, more positive. Forms are made of prime steels



that have rerolled rail stakes. Battered or straight face in straight, fixed or flexible radius styles immediately available in any desired quantity.



Partially battered curb forms are available in two different types. Contractors can have either the single or two piece form. Both have the strength and ruggedness that is typical of Heltzel Steel Forms.

Adjacent forms for adding curbing to slabs already in are available in the widest variety of combinations.

SPECIAL FORMS

Whatsoever your forming needs it pays to specify Heltzel Forms. Heltzel will build forms to meet any specifications — for islands, foundations, driveways, piling, etc. *Literature available on all form types and styles.*

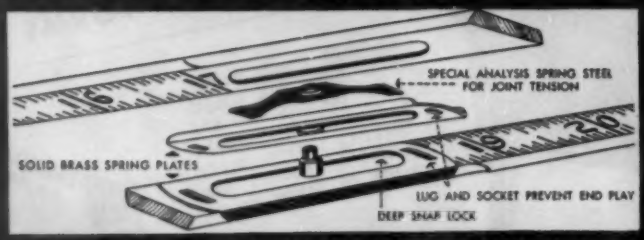
247

HELTZEL STEEL FORMS

THE HELTZEL STEEL FORM AND IRON CO., 410 THOMAS RD., WARREN, OHIO

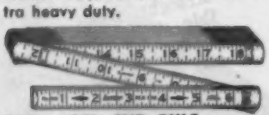
. . . for more details circle 281, page 16

WHY LUFKIN NEW Spring Lock Joints guarantee accuracy longer


SPECIAL ANALYSIS SPRING STEEL FOR JOINT TENSION
SOLID BRASS SPRING PLATES
LUG AND SOCKET PREVENT END PLAY
DEEP SNAP LOCK

Exclusive on "RED END" Folding Wood Rules

X-46 EXTENSION RULE
6" brass slide for inside measurements. 50% heavier wood for extra heavy duty.



066 — RED END RULE
All Red End features but without extension.

066-D ENGINEERS RULE
Red End quality, marked feet, 10ths and 100ths; and feet, inches and 16ths.

Exclusive Lufkin "Spring Lock" joints lock securely . . . eliminate end play . . . and maintain accuracy. Red End rules are straight-grained hard maple, tough and flexible. Bold black markings embedded in wood. Plastic coated for longer wear.

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PRECISION TOOLS
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CUT YOUR COSTS
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ARROW
Mobile HYDRAULIC HAMMERS

One-Man Operation

In one day one operator with an ARROW MOBILE HYDRAULIC HAMMER can do more work than four or five men using ordinary methods of concrete breaking, asphalt cutting or tamping. And he will do a better job.

Exclusive Creeper Drive

Operator can control the speed during any operation. To avoid skipping or overlapping blows, he can move the hammer from an ultra-slow speed to 20 feet per minute by using ARROW'S exclusive creeper drive.

Manual or Automatic Hammer Control

By using the Automatic Hammer Control, driver fatigue is reduced, production is greatly increased on jobs where blows of uniform force can be delivered. Merely set the length of the stroke, the automatic control does the rest. Operator has full control of hammer impact. Operator can deliver gentle pats or crushing blows at will.

WRITE OR WIRE NOW FOR COMPLETE INFORMATION

ARROW MANUFACTURING COMPANY
194 WEST DAKOTA DENVER, COLORADO

. . . for more details circle 243, page 16

PRESTRESSED DESIGN

(Continued from page 125)

$$V_L = 60 \times \tfrac{1}{2} \times 4/5 \times 1.276 = 30.6K$$

$$V_{ult} = 20.2 + 3\ (30.6) = 112K = 112{,}000 \text{ lb.}$$

Checking by the alternate ultimate shear formula, we have

$$V_{ult} = 2(20.2 + 30.6) = 101.6K = 101{,}600 \text{ lb.}$$ Hence use

$$V_{ult} = 112K$$

For the horizontal shear formula we also need I_c, t, and $a'\bar{y}$. We shall compute the properties of the composite section at its neutral axis since we want $a'\bar{y}$.

I_c (from previous calculation) = 130,398.

The point we select for which to check maximum horizontal shear is at the center of gravity of the beam, hence $t = 6$ (see fig. 2).

To find $a'\bar{y}$ we set up the following calculations:

(1)* $4.84 \times 6 \times 2.42$	=	70.28
(2) $6 \times 3 \times \tfrac{1}{2} \times 3.84$	=	34.56
(3) $6 \times 12 \times 7.84$	=	564.48
(4) $.79 \times 36 \times 1 \times 10.34$	=	294.07
(5) $.79 \times 48 \times 6 \times 13.84$	=	3,148.88
	$a'\bar{y}$ =	4,112.27

Now substituting in our horizontal shear formula we have

$$v = \frac{112{,}000}{130{,}398 \times 6} \times 4{,}112.27 = 589 \text{ psi.}$$

In order to get s_t we must first get f_t'. We calculate it at the center of gravity of the composite section. One of the axioms of structural design is that the maximum shearing stress in a cross-section usually occurs at the center of gravity of the cross-section. Since the minimum thickness of the beam is also at this point, it is the point of maximum horizontal shearing stress. This c.g. is 25.16 in. above the bottom of the girder. We must use stresses due to final prestress, hence, we refer back to previous calculations on the beam and find that $f_F^t = -97$ psi and $f_F^b = +1905$ psi. In this case we are computing the concrete stress at the center of gravity of the section in the same manner in which we computed the stress at the centroid of the steel in the fourth step. The difference is that the centroid of the steel was 8.33 in. above the bottom and c.g. of the section is 25.16 in. above the bottom. We have then $1905 - (-97) = +2012$ psi available.

The c.g. is $\frac{25.16}{36}$ above the bottom

(Continued on page 208)

*(1), (2), (3), (4), (5) are areas shown in figure 3.

Pavement Widening Program in Iowa

● Curb breaker in operation. Back of curb is exposed so ram can knock curb off. High spots in curb section left by curb breaker are removed with jackhammer. Trench is bladed full at this time for safety of traveling public until ready for placing the widening concrete.

By A. M. Hensing and F. O. Bloomfield

Assistant Construction Engineer and Chief Inspector, respectively, Iowa State Highway Commission, Ames

Many contractors have had jobs in past two years, and much ingenuity has been shown in developing high-speed, labor-saving methods.

DURING the 1955 and 1956 construction seasons, Iowa has widened more than 1,000 miles of its nearly 3,850 miles of 18-ft. pavement as a part of a three-step highway modernization program. The purpose is to remove the deficiencies most often listed by the road users. This work has involved more than 70 contracts, some running as much as 19 miles in length. Removal alone has amounted to 2,500,000 lin. ft. to date.

Removal of the existing curb and placing of a 3-ft. widening strip of portland cement concrete on each side of the present 18-ft. paving constitutes the first step of the three-step program. The other two steps are resurfacing with asphalt concrete and rebuilding the shoulders to modern standards. (An extensive program of bridge widening is under way as part of step one but has not been included in this article.)

A typical pavement widening project consists of curb and flume removal, excavating and compacting the trench, placing, finishing and curing the new widening, and reshaping the shoulders.

In removing the curb, a 1½-in. saw cut is first made at the gutter line. A pass by a motor grader exposes the edge of the paving, after which the curb is broken off by the machine developed by construction engineer C. L. Gleason. The broken concrete is picked up and disposed of in waste areas. The concrete flumes are also broken up and removed.

The trench is usually made with a Do Mor attachment on a motor

Although the spotlight is on Interstate relocation, the highway departments must keep up their effort to improve the vast mileage of existing primary and secondary roads. Many such roads while inadequate or obsolete are physically in salvagable condition. Here the engineer's "kit of tools" includes patching, widening, resurfacing, improving shoulders, cutting down hills, reconstructing bad hill-and-curve sections; and widening or replacing small bridges. Articles are invited from readers giving the design and construction details of such projects. —The Editors.

grader. After the earth is excavated to the proper depth and width, the trench is rolled to form a firm, smooth subgrade. The trench bottom slopes away from the edge of the old paving at a rate of 2 percent; for 3 ft. of widening this amounts to .06 foot. The subgrade is lined with either asphalt saturated subgrade paper or polyethylene plastic.

Some contractors have built their own machines for placing and finishing the concrete in the trench. However most use a Blaw-Knox spreader modified by the addition of electrically driven vibrators, a steel channel side form, and a flat steel drag plate for smoothing the surface. The mixed concrete is hauled in dump trucks from a central proportioning and mixing plant, dumped into the spreader, and belted out to the trench.

As the machine travels forward (at 20 to 25 ft. per minute), the concrete is vibrated and struck off at the required elevation. Minimum finishing operations are needed to give the surface the finish required. Usually a pass with a straight-edge, cleaning a few crumbs at the inside edge, and dragging with a burlap drag, are all that is required. The surface is ¼ in. in 10 ft.

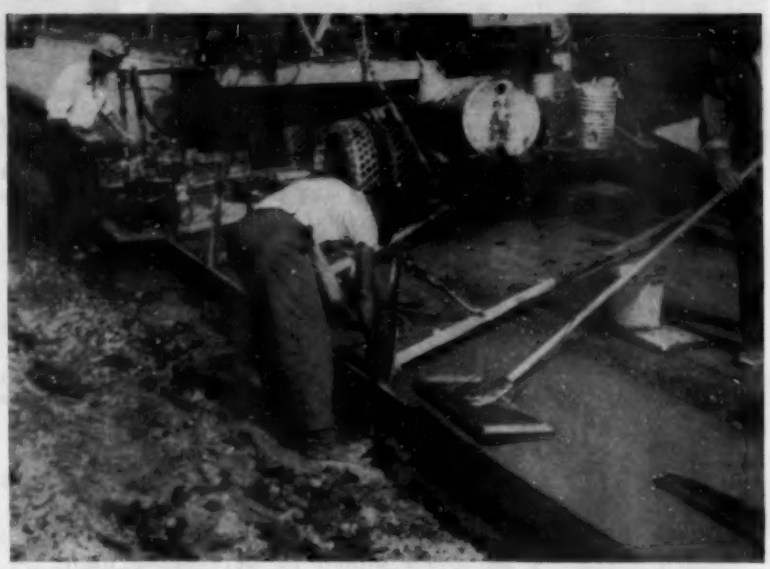
In a curb section, the old concrete form from which the curb was removed is brushed with a slurry of cement and water to insure bond. The outside edge of the widening is formed by a sliding form made of a 10-in. channel about 20-ft. long. This form is battered 2 in. to prevent sloughing of the fresh concrete.

The contractor has several choices of curing methods. The most popular one has been the use of polyethylene film placed as soon as possible without marring the drag marks. Some contractors use burlap and water, followed in 20 hours by Hunt process curing compound.

Beams are tested and sections opened when tests indicate a strength of 500 psi is attained.

Shouldering consists mostly of blading the trench material over the old shoulder and compacting the trench at the edge of the widen-

(Continued on page 139)



● **Placing and finishing concrete on tangent section—a typical rig including slip form and vibrator.**

● **Trenching with attachment on motor grader. Man behind blade is checking for depth and slope of trench bottom. (Right): Placing and finishing concrete widening on curve.**

More and more shovel operators are getting the point!

AMSCO® hardfacing cuts digging costs

On heavy digging jobs, power-shovel dipper teeth and dipper lips take rough punishment. Rounded off edges and teeth lead to wasted power, slower operation and smaller loads . . . resulting in increased digging costs.

Amsco has the answer to your dipper wear-problems!!

Hardfacing of teeth and dipper lips with *extra tough* Amsco hardfacing alloys can greatly increase service life, improve production operations, reduce power consumption.

For best results with Amsco Hardfacing Electrodes, the weld deposit should be not less than 3/16" in thickness, applied in a thin layer of weld over the parent metal, followed by a heavier layer to the desired dimensions. This will assure an even, flat bead without porosity. See illustrations for proper positioning of hardfacing deposits on dipper teeth and lips.

For full information on proper hardfacing methods and materials, contact your Amsco Welding Distributor. Or write to American Manganese Steel Division, Welding Products, Chicago Heights, Ill.

Dipper teeth and lips showing proper weld deposits with Amsco Hardfacing and Amsco Manganese Steel build-up.

AMERICAN Brake Shoe COMPANY

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For dependable operation

Gar Wood-St. Paul hoists operate through shift after shift with less maintenance attention. Time-tested hydraulic system has a built-in oil reservoir that eliminates pump starving. Simplified construction means smoother operation, easier servicing. Hoists are matched with a full line of stress-tested dump bodies.

GAR WOOD

PLANTS IN WAYNE AND

on round-the-clock shifts go GarWood

Today's tight construction schedules demand equipment with maximum dependability. That's why production reports on grueling "round-the-clock" shifts are being watched with great interest. On jobs like this, Gar Wood dependability is paying off big . . . production is high with only minimum time out for maintenance!

Gar Wood's dependability is the result of advanced engineering from the ground up. Every part is designed for the specific function it must perform . . . designed to give you "round-the-clock" dependability. For more information, contact your Gar Wood construction machinery dealer or truck equipment distributor. Or, write direct to Customer Service Dept., Gar Wood Industries, Inc., Wayne, Michigan.

With Gar Wood "75" excavators there's less operator fatigue on long shifts. Direct manual controls retain true "feel"... are located for instant control with less effort. Drum clutches are power actuated . . . no pressure is needed to keep clutch engaged, and release is positive. Power steering increases maneuverability.

Gar Wood Tipdozers are matched to the power and stamina of Euclid TC-12 Tractors. Hammerhead-type push beams provide maximum rigidity against side thrusts. Hardened steel pins and bushings mean longer life. Gar Wood's hydraulic unit gives operator instant control of Tipdozer blade. Hydraulic pump, valve and lines are completely enclosed and protected.

Gar Wood-Buckeye ditchers are known for their ability to stay on the job. From the ground up they're designed to dig ditch . . . each assembly is engineered for its specific function. Servicing is quick and easy because of Buckeye's unit construction, parts interchangeability, and "Quick Change" rooter bits.

INDUSTRIES, INC. Wayne, Michigan

YPSILANTI, MICH.; FINDLAY, OHIO; MATTOON, Ill.; RICHMOND, CALIF.

. . . for more details circle 272, page 16

These two Allis-Chalmers HD-21 Tractors—which net 200 cu. yds. per hour on an uphill haul for Grannis & Sloane, Inc., Fayetteville, North Carolina—are equipped with A-C Torque Converter Drive, standardizing on Twin Disc Torque Converter components.

"Torque Converter tractors net us 200 cu. yds. per hour ...and the haul is uphill all the way!"

That's the report from Fred Hauck, hard-working superintendent of Grannis & Sloane, Inc., Fayetteville, North Carolina.

He's talking about two Allis-Chalmers HD-21 tractors, working on a 3,800,000-cu. yd. grading and excavation job at Duke Power Company's new Plant Allen in Belmont, North Carolina.

They're used to push-load motorized scrapers in making a 6300 ft.-long discharge canal—a 2,200,000-cu. yd., *uphill* earthmoving job. With the torque converter-equipped tractors, Mr. Hauck is hitting well over 200 cu. yds. per hour on a 1500-ft., one-way haul—most of it on a 5% *uphill grade* out of the canal.

"These HD-21's, with torque converters," says Mr. Hauck, "have made one of the roughest jobs we've ever tackled much easier. They've saved us a lot of time and money."

Torque converter drive offers *you higher work output in less time,* and *longer equipment life* because it matches power to load demand, *automatically,* thus minimizing or eliminating gear shifting . . . it *eliminates* harmful engine lugging and stalling . . . it cushions *out*—through *fluid* connection — overloads, shock loads and vibrations — providing *longer tractor life with less maintenance.*

For these reasons, Allis-Chalmers designed torque converter drive into the HD-21, as standard equipment (it is optional on the HD-16). Since the inception of torque converters in crawler tractors in 1940, Allis-Chalmers has *standardized* on Twin Disc Torque Converter components.

Specify a torque converter for *your* next HD-16. For details on Twin Disc Torque Converters—*single-stage and three-stage* — request Bulletins 508 and 135-E, respectively.

TWIN DISC

TWIN DISC
Torque Converters

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES OR SALES ENGINEERING OFFICES: CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEWARK • NEW ORLEANS • TULSA

. . . for more details circle 334, page 16

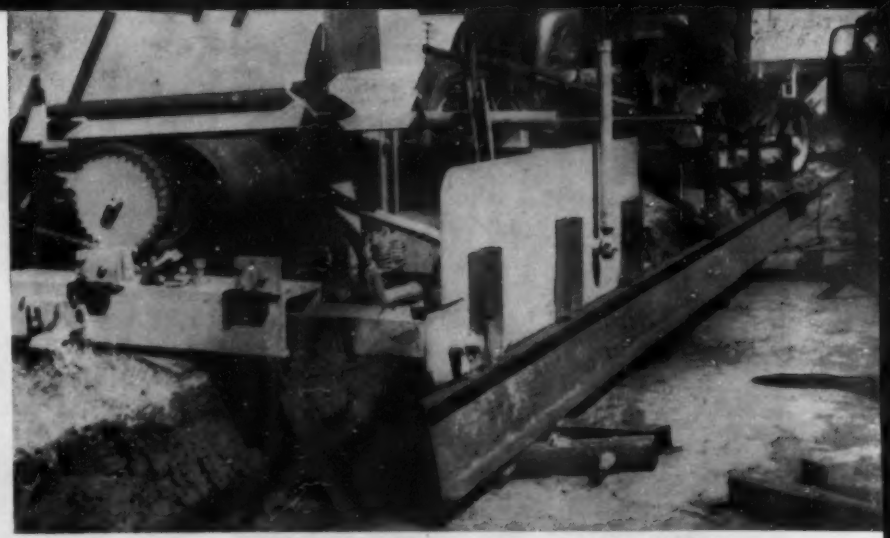
PAVEMENT WIDENING

(Continued from page 134)

ing. In closed ditch sections, end haul is required and this material is deposited where the shoulders are narrowest within a free haul limit of one mile.

Contraction joints made by sawing are installed opposite expansion and contraction joints in the old slab. Expansion joints are also installed in the curb section only, opposite the old expansion joints.

● *Matching Existing Asphalt.* Many miles of 18-ft. pavement had already been resurfaced with asphaltic concrete when the 1955-56 program was begun. In curb sections it was found difficult to match the edge of these resurfaced pavements. To make a smoother joint, a 3-in. deep saw cut was made 7½ in. inward from the back of the curb. The cut was 1½ in. in asphaltic concrete and 1½ in. down in the old concrete curb. When this was broken off, a square edge was formed which was easily matched with the new concrete widening.



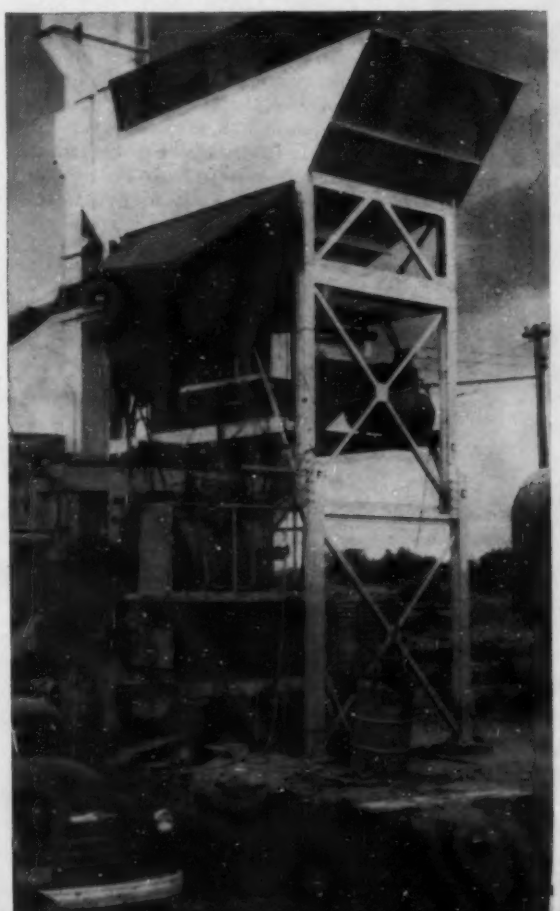
● **Building slip form on Blaw-Knox spreader. Maginnis vibrators mounted.**

This type of construction lends itself to the ingenuity of the contractor. Runs of 10,000 to 12,000 lin. ft. per day have been made by some of the better equipped and more efficient contractors.

The policy of the Iowa highway commission is to widen the narrow pavements with a surface safe and smooth for travel, to be followed, as financing permits, by asphaltic concrete resurfacing; and finally to rebuild the shoulders to a standard 10-ft. width. Heavily traveled roads are given special consideration when sight distance or alignment is involved. Where necessary, hills

● **Checking pavement's surface smoothness with a wheel-mounted straight-edger.**

● **Automatic batcher discharging directly into 34E single-drum mixer stationed below—one common type of plant for the widening concrete.**



● **Method of placing and holding down plastic film.**

● (Left): View showing Highway 69 with typical 18-ft. pavement before widening. Note curb section. Saw cut for curb removal is made along gutter line. (Right): Same view after curb removal, addition of widening strip and completion of shouldering.

● Polyethylene film used for curing. Note barricades for keeping traffic off. Curing cover remained in place until test beams showed strength of 550 psi (usually about five days).

Iowa Highway Funds Struggle

Iowa's Governor Loveless and house roads chairman Goode of the state legislature recently became involved in a dispute over farm-to-market road funds.

According to a newspaper report, the governor gave out figures indicating that farm-market funds have built an unobligated balance of over $8 million. He proposed that the legislature put it back in the state fund, which was short.

Goode countered in the news headlines with the claim that the surplus was due to "arbitrary administration of the state highway commission." He said that the commission had refused to add additional dirt roads to the farm-to-market system until recently and would not allocate money unless "perfectly good roads" could be torn up and black-topped.

are cut down or the line relocated to improve alignment and paved with 24-ft. standard concrete.

All of our widening is done under traffic. Flagmen direct traffic at points of actual work. Open trenches and fresh concrete are well protected by barricades and lights. There is practically no inconvenience to traffic except for slight delays at the site of concrete spreading operations, where one-way traffic is imperative.

The reaction of the traveling public has been unanimously favorable. Iowa's traffic has long since outgrown the 18-ft. pavement which "got Iowa out of the mud." This program is a big step in modernizing our Iowa highways.

● Completed shoulders on newly widened road—offering the traveling public a 24-ft. paved width and ample shoulder.

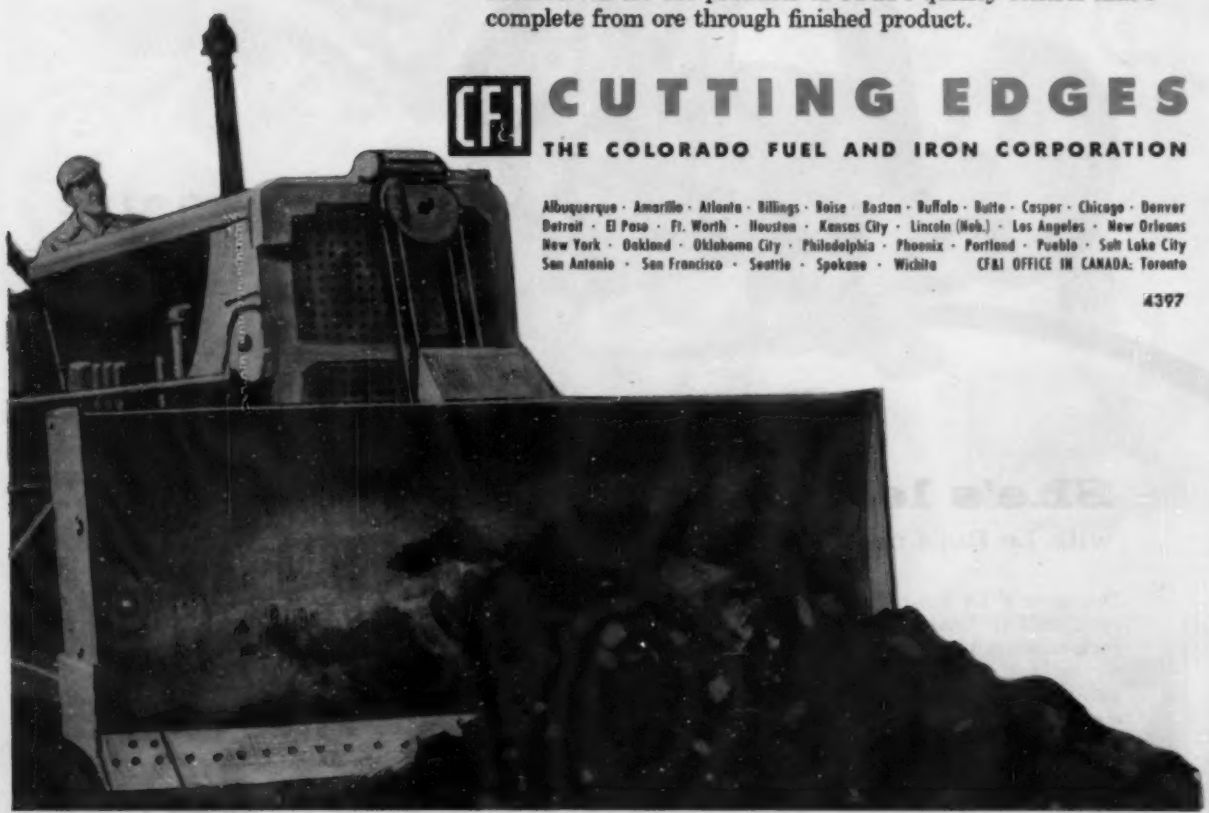
for tough earth-moving jobs . . .

CF&I CUTTING EDGES

When you've got an earth-moving job that's mighty tough . . . when you *have* to have cutting edges that can take rough going—that's the time CF&I Cutting Edges really pay off!

For every CF&I Cutting Edge—whether it's for a scraper, grader, dozer or allied equipment—is carefully made from special analysis steel that's selected for its resistance to abrasion and fatigue, then scientifically hot rolled, punched and inspected to make sure it's perfect.

Next time you need cutting edges, make sure you investigate CF&I Cutting Edges. You'll find that they are available in a wide variety of lengths, widths, thicknesses and hole spacings; flat or curved, with beveled or square ends, and in different finishes. All are the products of CF&I's quality control that's complete from ore through finished product.



CF&I CUTTING EDGES

THE COLORADO FUEL AND IRON CORPORATION

Albuquerque · Amarillo · Atlanta · Billings · Boise · Boston · Buffalo · Butte · Casper · Chicago · Denver
Detroit · El Paso · Ft. Worth · Houston · Kansas City · Lincoln (Neb.) · Los Angeles · New Orleans
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4397

. . . for more details circle 263, page 16

She's learning how...

with Le Roi's new shock-absorbing rock drill

Dog-gone if Le Roi didn't go and do it! They finally invented a rock drill that takes the tooth-rattling kick out — but keeps the rock-hammering bite in! Why, even a girl can handle it! A special torsion rubber cushion in the handle stops 55% of the worker punishment without sacrificing an ounce of impact at the bit. That means less fatigue—greater comfort—higher man/day production.

Interested? Well, head for your Le Roi distributor . . . he's got the new Model H10, H111, and H12 sinkers in stock . . . he'll demonstrate. Or write Le Roi Div., Westinghouse Air Brake Co., Milwaukee 1, Wis. P.S. The girl's name is June, 5'4", 110 lbs., 36-22-36.

LE ROI
NEWMATIC
AIR TOOLS

PORTABLE AND TRACTAIR® AIR COMPRESSORS • STATIONARY AIR COMPRESSORS • AIR TOOLS

All Purpose

LIFT-LOADER

BROOM

BERM LEVELER

HUBER-WARCO MAINTAINER

The Huber-Warco M-52 Maintainer with torque converter is an all-purpose, year 'round performer, capable of outperforming many machines that are larger, heavier, more costly, slower, more expensive to operate and more limited in use. With hydraulically controlled attachments, the M-52 Maintainer will perform service as a lift-loader, bulldozer, mower, broom, snow plow, side dozer, berm leveler and patch roller. See your nearest Huber-Warco distributor for details.

BULLDOZER

HUBER-WARCO COMPANY

Marion, Ohio, U. S. A.

HUBER
W
WARCO

. . . for more details circle 285, page 16

Roadbuilders!

START WITH ONE PAVER...
GROW with the BUTLER TX-4!

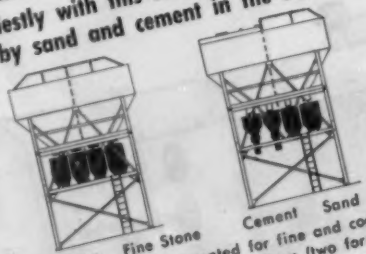
New Butler One-Man Batching System
Matches 1, 2, 3 or 4 Dual Drum Pavers

The New Butler TX-4 Roadbuilder Plant offers you ONE MAN operation with ultra-high speed automatic batching — no matter if you operate one paver — or two . . . or three . . . or four . . . or more!

Typical automatic TX-4 bin and batcher. Controls are pre-set on each bin, operate by push-button.

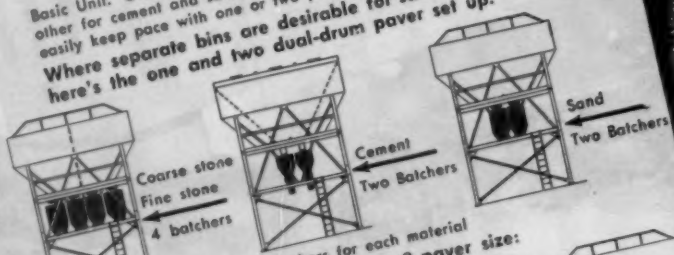
You can start modestly with this set up if your operation is best served by sand and cement in the same bin

1 or 2 pavers



Basic Unit. One bin compartmented for fine and coarse stone, the other for cement and sand. Eight batchers (two for each material) easily keep pace with one or two pavers.

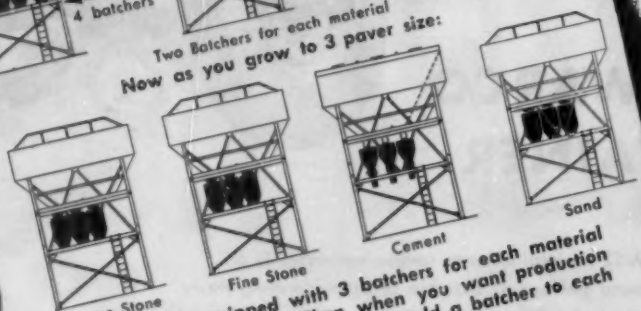
Where separate bins are desirable for sand and cement, here's the one and two dual-drum paver set up.



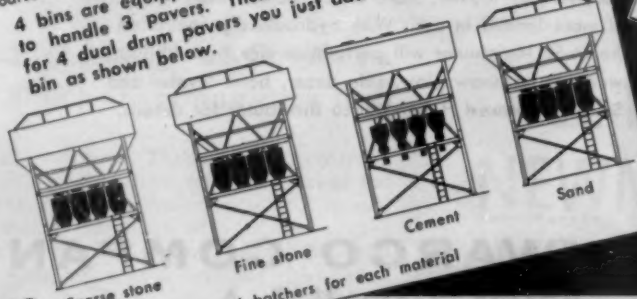
Two Batchers for each material

Now as you grow to 3 paver size:

3 and 4 pavers

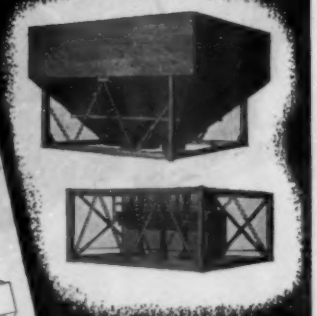


4 bins are equipped with 3 batchers for each material to handle 3 pavers. Then when you want production for 4 dual drum pavers you just add a batcher to each bin as shown below.



4 batchers for each material

So no matter how modest or how large your paving operation, the versatile, highly portable, completely automatic Butler TX-4 fits your requirements like stretchable socks.



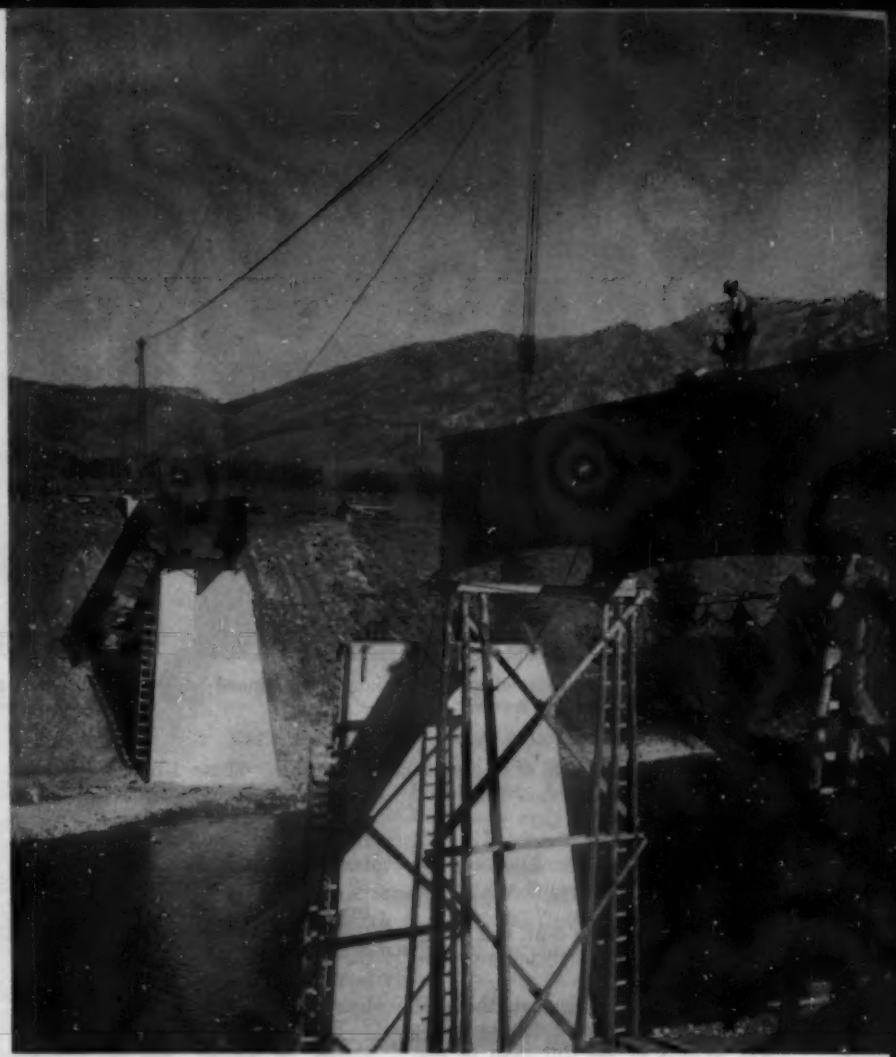
TX-4 is the most portable ever designed. Bins completely pre-assembled for easy crane handling. Batcher units handled with piping and wiring in place.

The Butler TX-4 is described right down to the nuts and bolts in this fact-packed Bulletin. Send a post card today. Just ask for Bulletin TX-4.

BUTLER BIN COMPANY
959 Blackstone Ave. • Waukesha, Wisconsin

. . . for more details circle 253, page 16

Masts leaned respectively to right and left for positioning two lines of girder sections on Idaho river crossing.



● **Erection proceeded from both sides. Near-side first pair of girder sections shown supported falsework log bent.**

Bridge Girders Set by High-Line

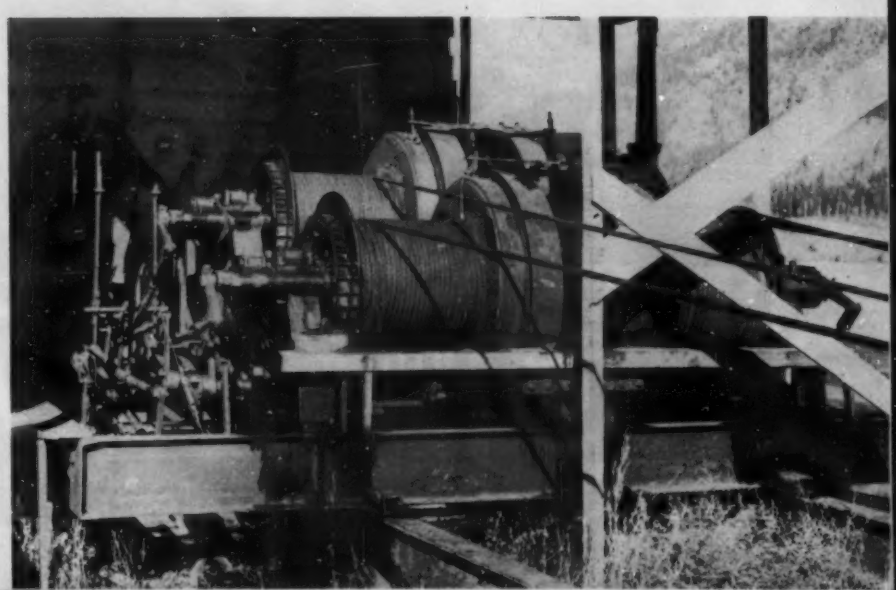
The recent relocation of U. S. 26 in eastern Idaho and western Wyoming was made necessary by the new Palisades Dam reservoir. Included in the Bureau of Reclamation contracts was a new $489,000 deck-girder bridge across the Snake River. The Snake at this point has just emerged from the mountains and is in a narrow canyon, requiring piers 90 ft. high and spans, 536 ft. between abutments.

Palisades Contractors, prime dam contractor, constructed the piers and abutments. The superstructure was contracted by LeBoeuf-Daugherty Construction Co., and Erickson and Pierson of Richmond, Calif., and subcontracted in two phases. W. B. Willett Construction Co., of Sacramento, Calif., subcontractor on steel erection, chose to erect the steel using a high-line. Wadsworth Construction Co., of Idaho Falls, Idaho, subcontracted the concrete slab and walkways.

Willett's use of the high-line caused considerable interest among reclamation engineers and other construction visitors. While Willett did not consider the method to be unprecedented, the widespread interest indicates that the method is not frequently encountered. The outstanding success of the high-line procedure on this project appeared to be due to careful engineering design of towers, anchors and lifting parts together with considerable experience in its use. Mr. Willett considers this method to be particularly convenient on the type of bridge which must be erected both sides and has used it on several other jobs.

The principles involved in using the high-line are simple. Just erect a tower

(Continued on page 131)



● **Four-drum gasoline driven hoist operated the cableway. Masts were tilted by hand-operated winch which was situated on side guys.**

● **Top half of second pair of girder sections being pinned and bolted to bottom member.**

● **Cantilevered mid-span section being placed and pinned. Nets were routine safety precautions.**

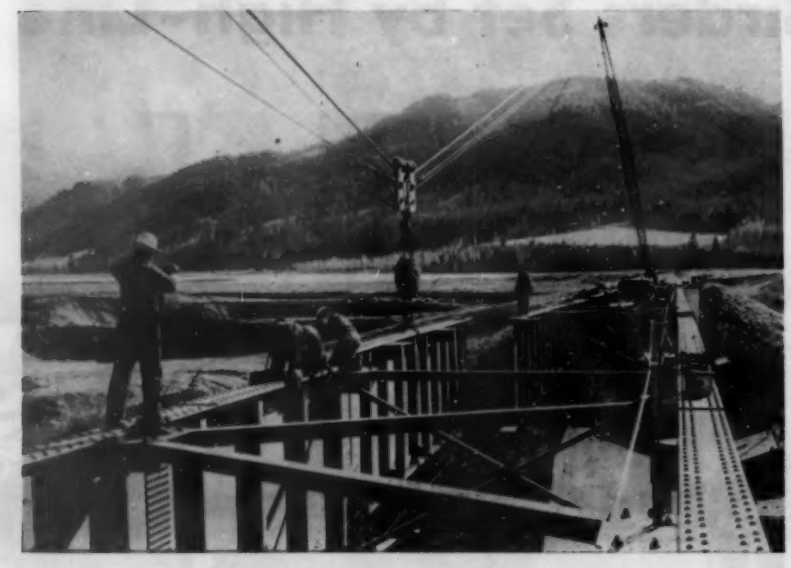
leaned 25 ft. either side of centerline. Leaning was accomplished with hand winches. Safety side guys were used in case of a slip in the hand winch. Side thrust on the base of the mast has not been found to require any special consideration.

Both towers had a 6-in. bell socket supported by a foot plate approximately 18 in. square.

At abutment No. 1, where the hoist mechanism was located, the foot plate was welded to the top sides of one end of two I-Beams, lying horizontally on the ground in line with the high-line cable. These I-Beams extended approximately 16 ft. from the bottom of the tower to butt against the hoist framework base. Pulley blocks were fastened to the I-Beams near the base of the tower. Hoist cables operated from the drum on the hoist mechanism through those blocks and to blocks at the top of the tower. The I-Beams served as a push block between the hoist and the bottom of the tower.

The foot plate at abutment No. 2 rested on planks laid flat on the ground. The foot plate was not anchored in any way, but weight alone on each side of the river on the bridge centerline. Arange each tower so that it can be leaned either way, so that the mast top extends a little past the outside of the bridge. Then connect the towers with a cable and arrange winches so you can pick up the girders and run them out and into place on the cable. However, as a design engineer, you could well spend a great deal of time calculating size of towers, cables, guy wires, and the stresses induced by loads, wind, sag and any number of other factors. Willett didn't explain how his final design was accomplished, but no doubt trial and error played their part, backed up by an extensive experience in handling heavy structural members.

● **Last girder section being shifted into place. Note that high-line is leaned to allow girder to be moved along outside of bridge. Final alignment was accomplished by adjusting tilt of mast.**



● *80-Foot Masts.* Willett used two 80-ft. lattice masts spaced 690 ft. apart. Head-to-toe guys were 2½-in. cables while the side guys were 4 part ½-in. cables. Reinforced concrete anchors were used for all guy cables. About 18 cu. yd. of concrete was required in head-to-toe anchors and 5 cu. yd. in each side guy anchor extending 6 ft. down.

The top of the masts could be kept it in place, even when towers were tilted.

The main-line cable from mast to mast was a 2⅛-in. high tension cable.

(Continued on page 149)

Model 80-D
2½ yd. Capacity

Every NORTHWEST a ROCK Shovel!

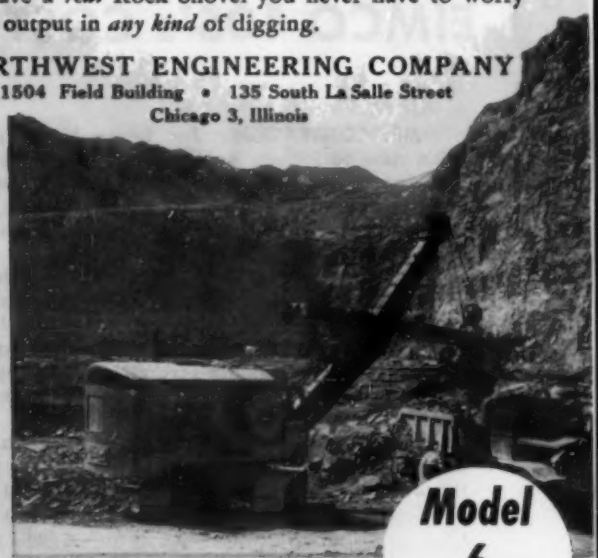
Here again you see *more* installations of Northwests in rock. Every Northwest is a *real* Rock Shovel because Northwests bring you the advantages that *make* a real Rock Shovel.

Model 41
1 yd. Capacity

The Northwest Dual Independent Crowd that utilizes force most independent crowd shovels waste, the "Feather-Touch" Clutch Control, the Cushion Clutch, Northwest design and construction and other Northwest features all combine to give high output in tough digging.—And, if you have a *real* Rock Shovel you never have to worry about output in *any kind* of digging.

NORTHWEST ENGINEERING COMPANY
1504 Field Building • 135 South La Salle Street
Chicago 3, Illinois

Model 25
¾ yd. Capacity



Model 6
1½ yd. Capacity

GS-6-ICG

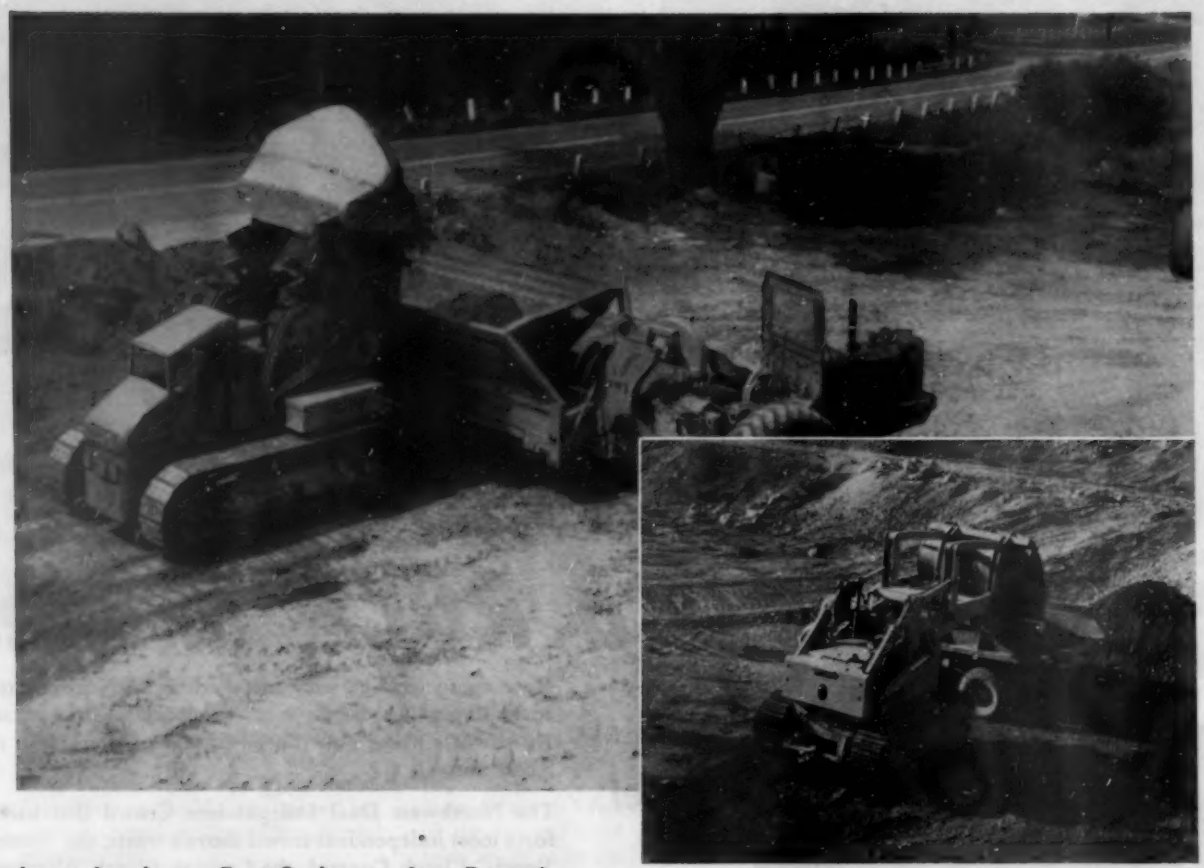
NORTHWEST

CRAWLER and TRUCK MOUNTED SHOVELS • CRANES • DRAGLINES • PULLSHOVELS

PRODUCTION PLUS $ MEANS MONEY

. . . for more details circle 341, page 16

ONE OUT OF EVERY THREE NORTHWESTS SOLD IS A REPEAT ORDER



Large Loads . . . Fast Cycles . . . Less Downtime

EIMCO 105's COST LESS . . . INCREASE PROFITS

MR. CONTRACTOR: For future highway bidding, plan now to include an Eimco 105 Excavator or Front End Loader (or both) in your equipment layout. Then, you'll know you have earthmovers to rely upon for dependable, high tonnage performance on the **TOUGH** jobs.

Your assurance of this is Eimco's knowledge and experience gained in almost three-quarters century, building thousands of heavy machines for the Mining Industry, where easy loading tasks rarely exist . . . and where — in spite of the severest of job conditions — large payloads, fast cycles and minimum downtime must be maintained if profit is to be made.

Both 105 Loaders have this same "extra" margin of built-in strength for the **tough** jobs. Both mount on the basic 105 crawler-tractor that gets extra performance from every attachment through high-speed mobility. Each employs an entirely different operating principle for tasks where physical conditions make one or the other more practical.

The 105 Excavator is ideal for highway tunnel work . . . or narrow cuts where overhead discharge eliminates awkward "dump position" maneuvers . . . speeds cycle time and minimizes interference with by-passing motorists.

The 105 Heavy Duty Front-End Loader is ideal where discharging into light units . . . handling fine, dusty or extremely wet material . . . or cutting smooth grades call for close control. Breakout force on this machine is 40,000 pounds.

On any given **TOUGH** job that really tests the ability of equipment to produce, Eimcos will move more yards every day than any other equally-rated machine.

Get all the facts on 105 Eimcos before you buy!

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Tex. Birmingham, Ala. Duluth, Minn. Kellogg, Ida. Pittsburgh, Pa. Seattle, Wash.
Cleveland, Ohio Houston, Tex. London, England Gateshead, England Paris, France Milan, Italy Johannesburg, South Africa

B-256

. . . for more details circle 348, page 16

● **Completed bridge helps eliminate old traffic snarling junction of highways U. S. 26 and 89 serving Palisades Dam, Jackson Hole, Yellowstone Park and other nearby scenic vacation areas. (U. S. Bureau of Reclamation photos.)**

HIGH-LINE GIRDERS

(Continued from page 146)

This cable was allowed to sag 70 ft. under the heaviest members, which were the center sections weighing 27 tons each. There was no messenger cable, as a 4-drum hoist was used to pay out on one as the other took in line on the travel. This hoist was gasoline driven. The fourth drum was used to tighten or slack the main line, reaved 9 parts from mast top to the head-guy socket. Normally, members were loaded at each mast. In this instance, one mast was located on a high fill and there was no way to bring the load under the carriage.

No special safety precautions were found necessary. Nets were used in a routine manner. It was found necessary to use care not to get caught with a section cantilevered out into a gale wind. However, once a pair were in place the lateral X-bracing took the side sway.

● *Shipped by rail.* Girders were shipped by rail to Ririe, Idaho, and trucked 50 miles to the site. Members varied in length from 53 to 67 ft. and weighed from 16 to 27 tons.

Erection began at abutment No. 1, the fixed end. The first pair of girder sections was placed with one end on the abutment bearing plates and the other end supported by a falsework bent constructed of logs. The second pair of girder sections was pinned and bolted to the first sections at one end and supported on the loose and on another falsework bent. The bottom half members of the third girder sections were landed on expansion rockers at Pier No. 1. The top half was then placed and bolted and pinned to the bottom half.

Parts of the lateral bracing at span No. 1 were left out until span No. 3 was erected to allow room for span No. 3 girder sections to be moved into place with the high-line cable positioned on centerline.

Upstream and downstream field splices were bolted and pinned 50 percent before riveting began. Riveting began after erection was completed to the pier.

Upon completion of span No. 1 the contractor proceeded in the same manner to erect the far-side span No. 3.

● *Bracing pinned.* When erection of span 1 and 3 was completed all cross bracing and lateral bracing was pinned and bolted 50 percent, and all field splices riveted 100 percent.

Girder sections for the mid-span were moved along the outside of the bridge with high-line masts tilted. When the girders reached their longitudinal position they were shifted into horizontal alignment by adjusting the tilt of the masts. One pair of girder sections was cantilevered from span No. 1 and one pair from span No. 3. The top and bottom chords at the cantilevered field splices were bolted and pinned 100 percent. All lateral and cross bracing between the girder sections were bolted and pinned in place before the final pair of girder sections was moved into place.

When the final pair of girder sections was moved into position, closing the mid-span gap, the top and bottom chords of all mid-span field splices were bolted and pinned 100 percent. End web splices were bolted and pinned 50 percent before riveting began.

AGC '57 CONVENTION

(Continued from page 59)

look of the individual highway contractor. Some of these:

Subcontracting. The association's legislative and subcontracting procedures committees met jointly prior to the convention to consider current national legislative activities. Of special concern was proposed legislation which would compel general contractors to name the firms doing their specialty and mechanical subcontracting. The AGC leadership has vigorously opposed such legislation through several past sessions of Congress as seriously hampering the general contractor in carrying out his necessary functions. Recent bills have reflected a sincere effort to meet some of the objections, among other things permitting the contractor to change his subs under certain conditions, or at will after five days following the letting. Committee chairmen have met with representatives of the subcontractors to iron out differences.

● *Other Legislation.* The AGC labor and legislative committees have unanimously opposed any further extension of Wage and Hour law coverage and will support all legislation which excludes from coverage employees other than hourly paid employees at the site.

The committees also voted to support the principle of prevailing wage rates, but as a proper function of the states. It also opposed a pending bill to extend the Eight Hour law to highway construction.

"Fiberthin" 40x80 Foot Building Erected in One Hour

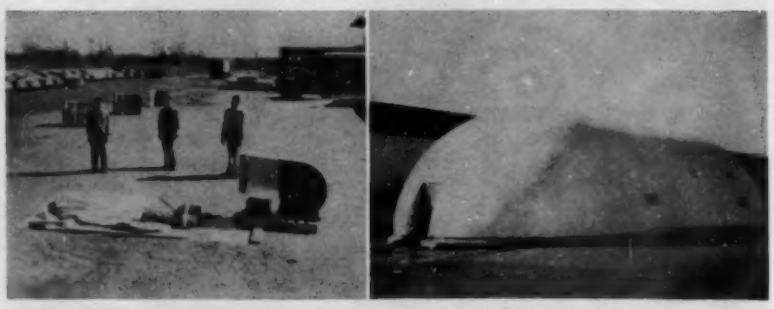
The "Airhouse," a structure which is literally built on air, has been introduced by the Eastern Marine Products Corp., New Rochelle, N. Y. Constructed of U. S. Rubber's Fiberthin and supported entirely by low-pressure air introduced by a ventilating blower, the "Airhouse" is said to represent a new principle in building construction. In its deflated state, a 40 x 80 ft. unit weighing only 400 lbs. is compact enough to be carried in a station wagon. Three men using a ventilating blower can put the building up in one hour, according to its manufacturer. No metal or wood framework is needed.

The structure is anchored to the ground by an encircling tube of Fiberthin filled with either water or sand. It can be erected on any level drained surface, will withstand strong winds and a heavy load of snow, it is said. Windows can be provided, though the company adds that the white translucent material admits enough daylight to permit operating inside without lights. Doors can be provided which will allow passage of fully loaded fork trucks.

The "Airhouse" is composed of a series of Fiberthin panels sewn together and sealed with a vinyl coating. According to U. S. Rubber, the covering is almost impossible to rip, resists puncturing, flame, weathering, oil and most acids. Fiberthin has been used for tarpaulins, boat covers, irrigation dams, life rafts, baseball infield covers.

Applications of the "Airhouse" include use as a warehouse, materials shelter, contractor's field shop. It is available from 40 x 80 ft. and in almost any size up to 90 x 200 ft.

For more information circle 111 on Service Coupon Page 16 and mail now



● **The Fiberthin "Airhouse," shown (at left) before erection, and (right) ready for use, with door and windows visible.**

Truck-Mounted Crane

Anthony Truck Crane

The Truck Crane, requiring only 18 in. of space behind the truck or tractor cab and leaving the rest of the body free for payload, is announced by the Anthony Co., Streator, Ill.

Power for the Truck Crane is hydraulically operated with a PTO-driven pump. Boom swing is 280 degrees. It projects or retracts hydraulically in horizontal position or at any point up to an 85 degree elevation. Both horizontal and elevating-type booms are available. Capacity is 5,000 lb. Control levers are on both sides of the truck for operation from ground level. One lever provides forward, reverse, locking and speed control for each power movement. The valve bank, which locks automatically when levers are released, has a relief valve for prevention of overloading and subsequent damage to equipment.

For more information circle 112 on Service Coupon Page 16 and mail now

Improved Straight-edge for Pavement Checking

An easy-rolling straight edge for rapid detection of high or low places on forms and pavement slabs has been developed by the Viking Manufacturing Co., Manhattan, Kans. Designated the "Hi-Lo Detector," the machine dye-marks slab areas not within specification limits. The "Hi-Lo" is lightweight, consisting of a 10-ft. aluminum beam, with aluminum rubber-tired wheels rolling on precision ball-bearings. A center wheel measures up and down variations of the surface and magnifies them 20 times on a scale graduated in 1/8-in. readings. The front wheel is steerable from handle. Dye marker is controlled with the left handle grip, permitting an inspector to cover and mark a slab at an easy walking pace.

Viking Straight-edge

For more information circle 113 on Service Coupon Page 16 and mail now

20,000-Lb. Outdoor Fork Truck

Clark Fork Truck

The "Ranger-200," announced by Industrial Truck division of Clark Equipment Co., is designed for heavy duty in mud and over rough terrain. A 4-speed, power shift transmission and a torque converter with 3-to-1 multiplication are coupled with a 143-hp General Motors diesel engine for maximum power under adverse condition. Capacity is 20,000 lb. A gasoline engine is optional. 4-wheel or 2-wheel drive is obtained by moving a selector lever.

Direction control levers are located on the steering column. A single lever, also on the steering column, controls lifting and tilting movements. Power steering is standard. The "Ranger-200" has an underclearance of 14-in. and will travel 25 mph either forward or reverse. Turning radius is 312 in., wheelbase 108 in., length—less forks—207 in.

For more information circle 114 on Service Coupon Page 16 and mail now

Long-Burning Kerosene Lantern

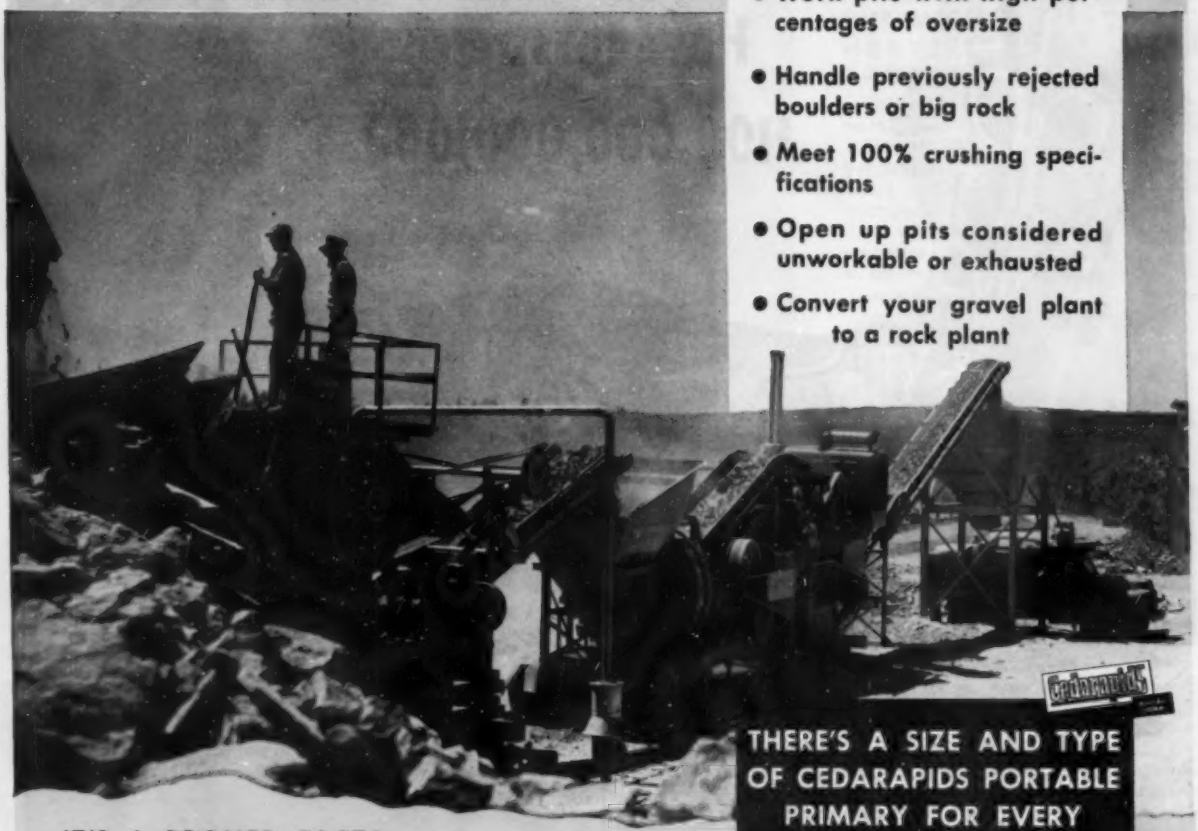
A new red globe kerosene lantern which will burn for 100 hours with one

(Continued on page 156)

What's New in Equipment and Materials

(Continued from page 48)

Double your secondary crushing capacity with a CEDARAPIDS PORTABLE PRIMARY



...and get all these other advantages!

- Work pits with high percentages of oversize
- Handle previously rejected boulders or big rock
- Meet 100% crushing specifications
- Open up pits considered unworkable or exhausted
- Convert your gravel plant to a rock plant

IT'S A PROVED FACT!

With a Cedarapids Portable Primary *of the size and type to fit your conditions* to handle the heavy crushing load ahead of your secondary equipment, you can double your plant capacity!

It adds a third stage of reduction to your operation, permitting your secondary crushers to handle twice as much material. It reduces the circulating load. More material will be taken off by the screen in your secondary plant before it reaches the crusher.

Equipped with a vibrating grizzly or scalping screen, your Portable Primary by-passes fines, sand, chips or dirt to prevent choking of the crushers.

You can turn *all* pit-run material, even big boulders, into specification 100% crushed aggregate. You'll have the capacity and flexibility to handle a wider variety of jobs . . . open up deposits considered unworkable because of excessive oversize or fines, re-open pits thought to be exhausted, operate in pits or quarries closer to the job to save hauling costs.

THERE'S A SIZE AND TYPE OF CEDARAPIDS PORTABLE PRIMARY FOR EVERY PRIMARY REDUCTION JOB

Single Jaw Crusher

15" x 24" 25" x 40"
22" x 36" 30" x 40"

Twin Jaw Crusher

18" x 36"

with low-cost Vibrating Grizzly

Increases output of primary crusher up to 25% by by-passing fines before they reach the crusher. Three sizes available with single or double deck.

with Scalping Screen

48" x 6' horizontal vibrating screen between feeder and crusher increases production in pits with low percent of crushing, or where specifications require 100% crushed particles.

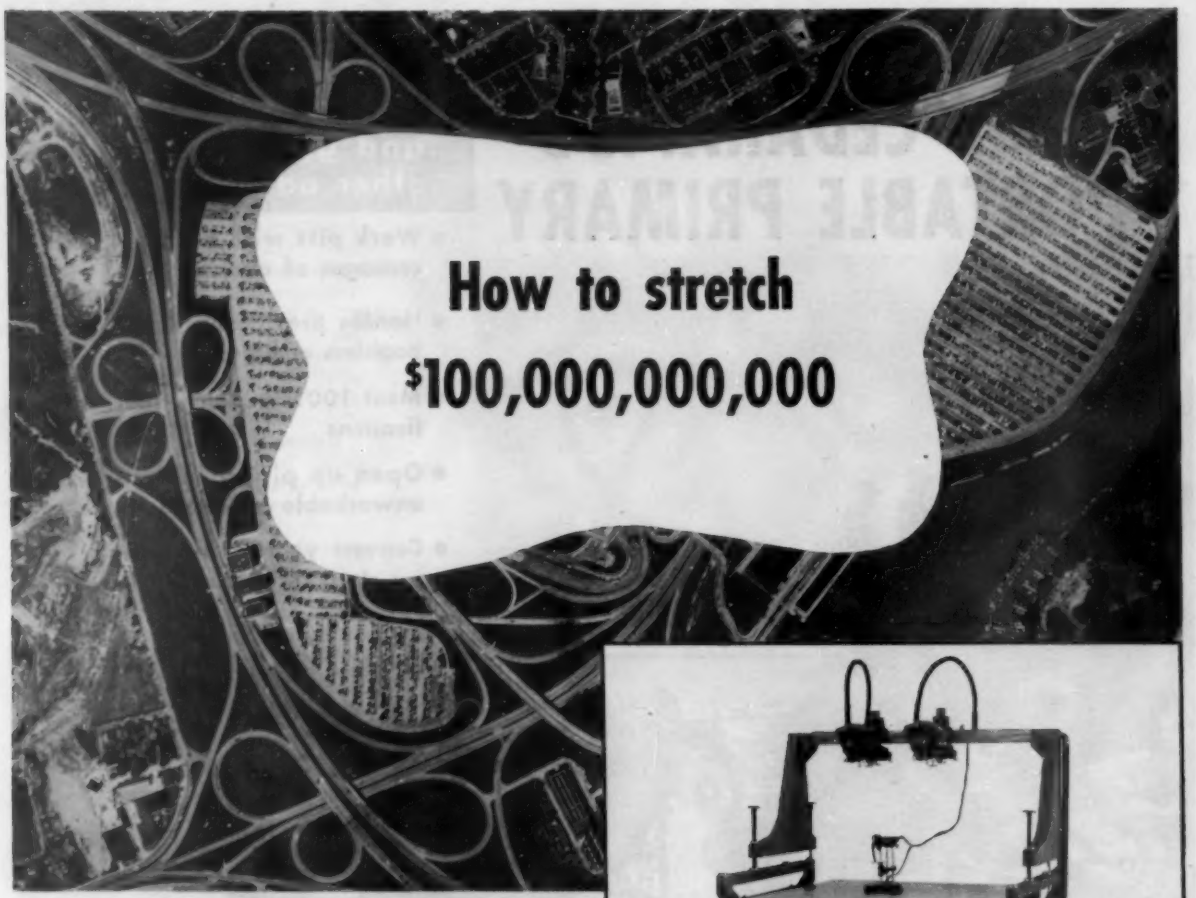
Portable Double Impeller Impact Breakers

30" x 42" 36" x 45"

With a reduction ratio of 20 or 30 to 1, this unit assures high capacity of desirable cubical shaped aggregate, which needs little or no further reduction.

IOWA MANUFACTURING COMPANY
Cedar Rapids, Iowa, U.S.A.

. . . for more details circle 293, page 16



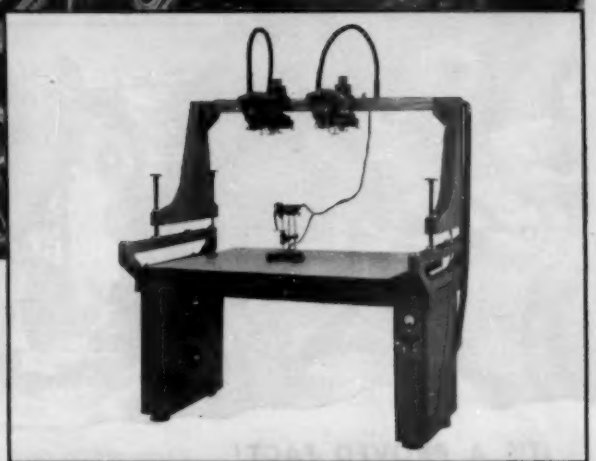
How to stretch $100,000,000,000

Photo by Air Survey Corporation, Arlington, Va.

That's the estimated cost of highway expansion planned for the next decade. B&L Balplex Plotters will stretch this budget over more and better roads by cutting costs from aerial photographs to final engineering maps.

Balplex saves time! Maps larger areas from fewer photographs taken at greater heights. Standard Multiplex operation, no training problems.

Balplex saves money! Complete capital equipment for precision mapping at scales as large as 1"/50', for only $4250. (Reduction printer & centering device optional.)



Bausch & Lomb

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☐ Send me data on the complete B&L photogrammetric line

NAME.....

TITLE.....

BUSINESS ADDRESS.....

CITY..... ZONE..... STATE.....

. . . for more details circle 248, page 16

GRADE-O-MATIC

.....a New Standard of GRADER PERFORMANCE

- No gear shift — No clutch.
- No engine lugging—No "spinning" drive wheels.
- Automatic torque multiplication as needed.
- Automatic adjustment of engine speed to load.
- Power and weight balanced to produce greatest possible "Push-Power" at the blade.

MODEL T-700 GRADE-O-MATIC, 190 h.p., 40,125 lbs.
MODEL T-600 GRADE-O-MATIC, 140 h.p., 30,420 lbs.
MODEL T-500 GRADE-O-MATIC, 125 h.p., 25,765 lbs.

GALION 1907 50 ANNIVERSARY 1957

ESTABLISHED GALION 1907

Write for Literature.

THE GALION IRON WORKS & MFG. CO.
General & Export Offices, Galion, Ohio, U.S.A.
Cable Address: GALIONIRON, Galion, Ohio

Jim— We need a grader of this type. Let's check into Galion Grade-O-Matic C.A.

THE WORLD'S LARGEST, HEAVIEST AND MOST PRODUCTIVE GRADER.

Galion is now in production on a new motor grader, designated as Model T-700, which they claim is the world's biggest, heaviest, and most productive motor grader. The model T-700 is equipped with Galion Grade-O-Matic drive which utilizes a GM-Allison torque converter and power-shift transmission to achieve ease of operation and performance on the job.

The manufacturer states that the T-700 grader was designed and built new from the ground up, and has been work-tested across the country in all kinds of weather and on all kinds of jobs. Every part of the grader is said to be larger, heavier, stronger, more efficient, and specially designed to obtain tremendous "push-power" at the blade. The total weight of the Galion T-700, with scarifier, is listed at 40,125 lbs., and it is powered by a 190 hp Cummins diesel engine.

The Grade-O-Matic drive on the Galion T-700 is reported to greatly minimize the human element in achieving top grader performance.

The torque converter multiplies the engine torque up to 340% automatically as needed. It also absorbs the load shocks and prevents engine lugging or stalling. A tail-shaft governor on the torque converter adjusts the engine speed automatically to meet all loads or conditions — at any predetermined working or travel speed. The power-shift transmission does the shifting for the operator. All he does is move the fingertip control levers — one for forward-reverse, the other for low-intermediate-high speed. Either shift can be made while moving in either direction. There are 3 speeds forward, 3 reverse, with speeds ranging from creeper to high travel speeds in either direction.

Other features listed as standard equipment on the Galion T-700 grader include a hydraulic shiftable moldboard 14 ft. long, overlay end bits, twelve-ply 16.00 x 24 low pressure tires, four-wheel hydraulic service brakes, a transmission brake for parking, and a foot decelerator for quickly reducing engine speed thus permitting immediate return to travel speed without changing the hand throttle.

For complete information on the T-700 motor grader, write The Galion Iron Works & Mfg. Co., Galion, Ohio, or any of their distributors.

O.K. - Looks like the answer to the Big Jobs coming up. Jim

. . . for more details circle 271, page 16

HERE'S BIG-GRADER PERFORMANCE

. . . *economy size*

The Allis-Chalmers Model D is a full-fledged motor grader . . . and a "natural" for road construction and maintenance jobs where fine grading performance and low cost are both important!

It has the basic design and performance features found in machines costing up to three times as much, but there is one important difference: The Model D is compact and maneuverable enough to work in crowded areas where many other graders cannot operate.

To add still further to its usefulness, the Model D may be equipped with a rear-mounted, ⅝ cu-yd loader, scarifier, shoulder maintainer, leaning front wheels, power circle turn, shiftable moldboard. Optional cab offers year-round operator comfort.

Let your Allis-Chalmers dealer show you how the Model D can measure up to your standards of grader performance . . . at low cost. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

. . . . . for more details circle 236, page 16

ALLIS-CHALMERS *Engineering in Action*

This 125 cfm Gyro-Flo Compressor and PB-8 Paving Breaker combination is making short work of a heavy pavement job in a large Eastern city.

On any pavement job, you can

BREAK IT UP and FINISH IT UP

in record time with this I-R CONTRACTORS' COMBINATION

1 An I-R GYRO-FLO COMPRESSOR of the right capacity

With the complete line of Gyro-Flo rotary compressors, there's no need to haul around or pay for any more air power than you actually need. Now available in 85, 125, 210, 315, 600 and 900 cfm sizes, you can pick a unit with the *right capacity* to operate as many or as few paving breakers as the job calls for. That means no idle compressor capacity — no overloading that cuts tool pressure and slows up the work. What's more, GYRO-FLO's *proved performance* assures a smooth, dependable air supply that's tops in fuel economy and remarkably free from attention or maintenance.

2 I-R PAVING BREAKERS of the right weight and power

Ingersoll-Rand offers you the most complete line of paving breakers and accessories available today. From the big, heavy-duty, 100-lb Breaker and Pile Driver to the lightweight 20-lb Demolition Tool and Digger — you can match the *tool* to the *job*. Use only the weight and power you need — reduce operator fatigue and save air power cost. In addition, I-R paving breaker steels and accessories, designed and built to stand up longer on the toughest jobs, are available for every breaking and demolition application.

Ask your I-R representative for the complete facts on this time-saving Contractors' Combination.

Ingersoll-Rand 14-502

11 Broadway, New York 4, N.Y.

THE BEST AIR EQUIPMENT FOR BETTER HIGHWAYS

. . . for more details circle 349, page 16

What's New in Equipment and Materials

(Continued from page 150)

filling is now being marketed by R. E. Dietz Co., 225 Wilkinson St., Syracuse, N.Y. Listed as the "Number 100," this lantern, of all welded construction,

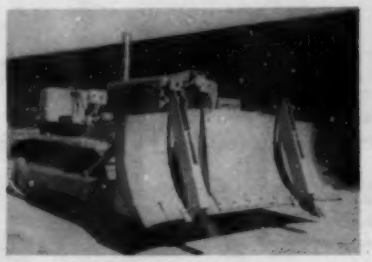
Dietz "Number 100" Lantern

holds 32 oz. of fuel. With streamlined cold blast design and 11¾ in. high, it is especially suited for barricade marking and warning purposes where long burning is a necessity.

For more information circle 115 on Service Coupon Page 16 and mail now

New Heavy Duty Ripper

The Ransome Corp., 2729 Hunting Park Ave., Philadelphia, Pa., announces its new model R-89 heavy duty ripper for attachment to bulldozers 43 in. to 60 in. high, in the 150 to 320-hp tractor



Ransome Ripper

range. The R-89 carries the one-man rack and pinion depth adjustment common to other Ransome rippers. It has a 4-in. by 7-in. ripping shank with a new 28-lb. cast manganese tooth.

For more information circle 116 on Service Coupon Page 16 and mail now

New 2-Way Hydraulic Sweeper

M-B 2-Way Sweeper

A new 2-way sweeper, completely hydraulic in drive and controls, has been added to the line of tractor-mounted sweepers manufactured by the M-B Corp., New Holstein, Wis. For fast two-way sweeping, the broom may be angled 30 degrees to right or left or to any intermediate position by means of an hydraulic swing ram controlled from the driver's seat. Unique swing arms keep the sweeping path centered ahead of the tractor regardless of broom angle, thus further speeding operations. The hydraulic pump may be front-mounted or rear PTO-driven, depending on tractor make.

This hydraulic sweeper is designed to fit most popular make tractors, using essentially the same underframe as the M-B mechanical sweepers. Adaptation of the sweeper head is also being made

The modern, effective way to handle cement for rear discharge!

OMAHA STANDARD

Air-Slide **CEMENT TRAILER**

incorporates the Fuller Air Slide Principle

Will cleanly evacuate 100 barrels of cement in 10 minutes. No pounding or vibrating necessary. Air pressure gives complete rate of evacuation control. Low height and perfect load distribution. Fast loading through a minimum of 3 roof hatches. Hopper bottom gravity flow models also available.

Prices and weights quoted on request.

Distributorships available in certain areas

"Custom-Made Material Trailers—for ANY Commodity"

OMAHA STANDARD

2401 W. Broadway, Council Bluffs, Iowa

. . . for more details circle 313, page 16

The Crest of Good Living comes to New York

Hotel New Yorker

JOSEPH MASSAGLIA JR., President
CHARLES W. COLE, Gen. Mgr.

34th Street at Eighth Avenue

Other MASSAGLIA Hotels . . .

- Santa Monica, Calif. Hotel MIRAMAR
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- Gallup, N.M. Hotel EL RANCHO
- Albuquerque, Hotel FRANCISCAN
- Washington, D.C. Hotel RALEIGH
- Hartford, Conn. Hotel BOND
- Cincinnati, O. Hotel SINTON
- Pittsburgh, Pa. Hotel SHERWYN
- Denver, Col. Hotel PARK LANE

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Hotel WAIKIKI BILTMORE Honolulu

CHICAGO MIDWEST HEADQUARTERS BOOKING OFFICE • 200 E. Walton DE 7-6344

World famed hotels—Teletype service—Television

for mounting in tractor front-end loaders in place of the bucket with a quick-mounting arrangement.

Adjustable spring-loaded broom pressure assures that ground surface contours will be followed. There is an 8-in. hydraulic broom lift for clearing curbings or obstructions and for traveling; and a removable sweeper hood for snow sweeping.

For more information circle 117 on Service Coupon Page 16 and mail now

Wheel-Type Ditcher

Expanding their line of crawler-mounted and rubber tired, vertical boom and ladder-type ditchers, Barber-Greene Co., Aurora, Ill., announces their entry into the wheel-type ditcher field with the model 774 machine. The new product is a crawler mounted unit, featuring a 5-ft. 6-in. digging depth with widths adjustable in 1-in. increments from 18 to 30 in.

Among innovations offered in the model 774 are: widespread use of hydraulic power transmission, a flexible connection between chassis and digging wheel which permits a 10-degree pivot while digging, an electric, magnetically actuated overload release clutch and a reversible, variable speed, spoil conveyor.

Using the "Hydracrowd" hydraulic drive, operator can select from an infinite range of forward speeds from 0 to 28 fpm, all independent of the digging wheel speed.

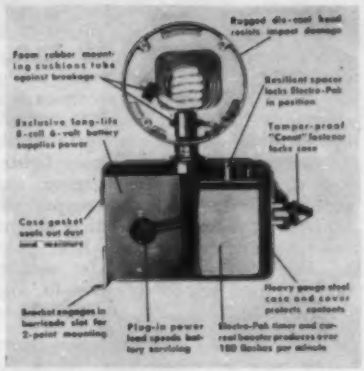
Barber-Greene Ditcher

For more information circle 118 on Service Coupon Page 16 and mail now

Barricade and Safety Lights

Improvements in its line of battery-operated Flasher safety lights, designed for low-cost, dependable hazard warning protections, are announced by R. D. Fageol Co., Kent, Ohio. Known as the HD series, the lights are powered by an 8-cell battery, reputed to afford up to 90 days of continuous operation without battery replacement or servicing. Exceptional resistance to tube breakage due to impact is assured by the exclusive 2-point foam rubber cushioned mounting of the Flasher neon tube. Two-point mounting of the light case and use of the Flasher vandal-proof "Conut" lock reduces theft and vandalism losses, it is claimed.

These lights produce over 100 brilliant neon flashes per minute, said to


Rugged die-cast head resists impact damage
Foam rubber mounting cushions tube against breakage
Resilient spacer locks Electro-Pak in position
Exclusive long-life 8-cell 6-volt battery supplies power
Tamper-proof "Conut" fastener locks case
Case gasket seals out dust and moisture
Heavy gauge steel case and cover protects contents
Bracket engages in barricade slot for 2-point mounting
Plug-in power lead speeds battery servicing
Electro-Pak timer and current booster produces over 180 flashes per minute

Fageol Flasher Lights

be visible up to 2 miles. Flasher safety lights have no delicate electronic components to cause operating difficulties or require expensive replacements, says the manufacturer. They are available with either uni-directional or two-way heads and with a choice of red, amber, blue, green or clear plastic lenses in any combination of these colors.

For more information circle 119 on Service Coupon Page 16 and mail now

Self-Contained Asphalt Plant

The Wylie model 1520 "Roadmaster" is said to deliver 15 to 20 tons of asphalt hot mix per hr. directly at the job site. Its mobility and self-contained design permit quick movement between locations and immediate operation. An ordinary dump truck can tow it.

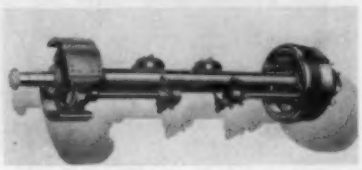
The trim aggregate hoppers hold over a cu. yd. of material each and, with the reciprocating plate feeder, coarse and fine aggregates are fed accurately into the elevator boot. After passing through the rotary dryer, aggregate enters a weight-controlled batcher and in turn is discharged simultaneously with a required proportion of hot asphalt into pugmill. Any regular or special specification can be met.

A cyclone type dust collector returns a part of the dust to the pugmill. All thermometers, gauges and control levers are centrally located at the one-man operator position. The "1520" is available with gasoline or diesel engine, and mounted on 6 pneumatic tires with stabilizer jacks or on skids as a stationary installation.

For more information circle 120 on Service Coupon Page 16 and mail now

Air Brake for Trailer Axles

A new 16½ in. x 8½ in. "P" series air brake for its TK-500 trailer axles has been announced by the Timken-Detroit Axle division of Rockwell Spring



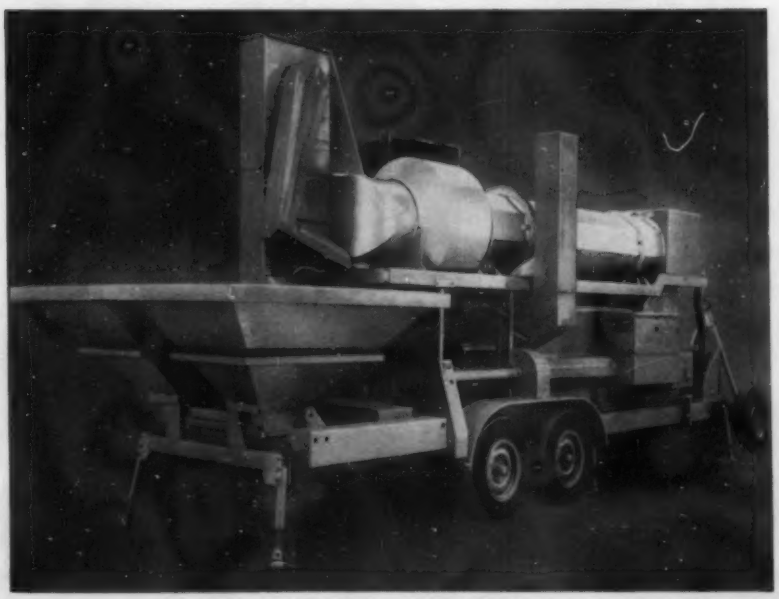
Timken-Detroit "P" Series Air Brake

and Axle Co., 100 Clark Ave., Detroit, Mich.

These brakes are for heavy braking applications and are mounted on TK-500 series axles with a load rating of 18,000 lb on the tires for each axle. Ten stud, light-weight hubs and drums are available.

Only the TK-500 series trailer axles have these new air brakes. The new units are in addition to the older "P" series air brakes for the TK-500 series.

For more information circle 121 on Service Coupon Page 16 and mail now



Wylie Asphalt Plant

257H Heavy-Duty Truck

Newest and largest model in the International V-line of heavy-duty trucks, the VF-230 is similar to the model RF-230 that has six-cylinder gasoline engine power, and the diesel-powered RDF-230-H, designed for extra-rough, off-highway projects and for moving heavy loads over semi-improved or improved roads for long distances at maximum safe speeds. Engine is the new International truck type V-549 V-8, rated at 257 h.p. Standard wheelbase 175 in.; GVW rating 60,000 lb.

International Harvester Co., Chicago 1, Ill., is the manufacturer.

International's Six-Wheel Truck

For more information circle 122 on Service Coupon Page 16 and mail now

Truck-Tractors Air Suspended

Air-cushioning to absorb heavy road jolts and high-frequency vibrations before they can reach the frame is featured in the new line of truck-tractors just brought into production by GMC Truck & Coach division, Pontiac, Mich. Air-filled rubberized bellows replace conventional leaf springs in these vehicles, and air metered into the bellows by leveling valves keeps floor heights at a constant level.

Other claimed advantages include greater payload capacity; air suspension elimination of spring repair, lubrication and replacement; smoother riding for driver and cargo; maintenance of a constant vehicle floor height for simplified loading and unloading; reduced breakage of fragile cargo; lighter weight, less expensive packaging; and the use of weight-saving components for over-all reduction of vehicle weight.

Basic models in the heavy-duty bracket have gross vehicle weights ranging from 22,000 to 59,000-lb. and gross combination weights from 38,000 to 90,000-lb.

For more information circle 123 on Service Coupon Page 16 and mail now

Automatic Drag Bucket Line

A new line of lower cost "A" Series automatic dragline buckets, with capacities from ½ to 3 cu. yd., is announced by Page Engineering Co., Clearing Post Office, Chicago 38, Ill. The new series has been released after field testing in virtually every type of digging condition.

Advanced design and construction

Page One-Yard Bucket

principles provide important savings in weight over the heavier "R" series Page automatics, and permit matching the new "A" series to some of the smaller dragline machines' lifting capacities for greater efficiency and production.

The "A" series automatics are available in light-medium, general purpose, and heavy duty classes. In all, the line comprises 33 buckets. Illustrated catalog A-57 upon request.

For more information circle 124 on Service Coupon Page 16 and mail now

Improved Concrete Cutter

Felker Manufacturing Co., 1128 Border Ave., Torrance, Calif., announced a series of new developments on models 257 and 367 concrete cutters. Improvements include a non-slip, high efficiency timing belt drive equipped with lugs which engage gear-like teeth on the pulleys for maximum positive power transmission. The extra torque and constant rpm are stated to mean longer diamond blade life.

A Vickers hydraulic power drive to

Felker Concrete Cutter

the rear wheels enables cutting on steep grades without slipping or coasting, gives a variable control of 0 to 90-ft. per minute. A reverse provides for backing up under power and simplifies loading and working in tight areas, according to the manufacturer. Other improvements include longer adjustable handles to provide easier balance on rear wheels for maneuvering, a pivoted engine mount for adjusting belt tension and a removable frame insert for easy access to spindle pulley for belt replacement.

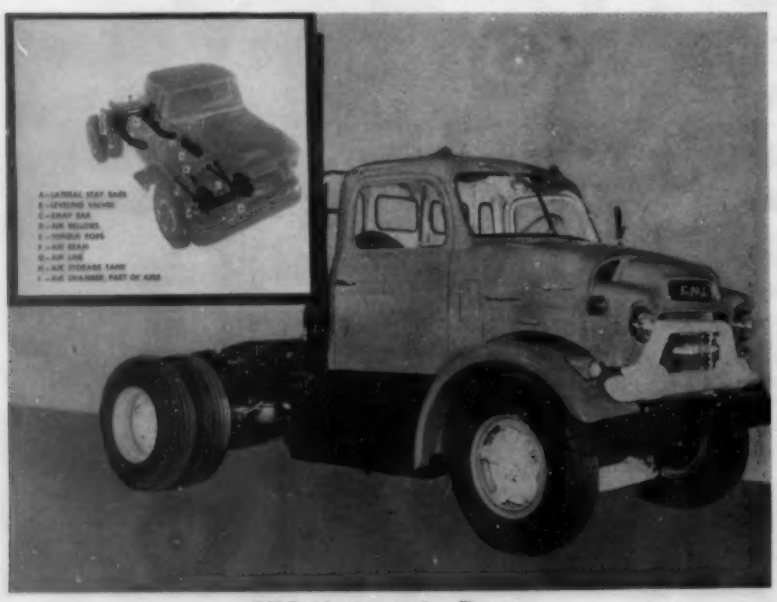
For more information circle 125 on Service Coupon Page 16 and mail now

Trailers Automatically Lubricated

The picture below shows a Lincoln "Multi-Luber" installation on a La-Crosse tandem axle, low-bed trailer. The luber is attached to a mounting bracket which in turn is bolted securely to the inside of the trailer axle. Capacity of lubricant reservoir is 4 gal., said to be sufficient for 90,000 miles of trailer operation. The feed lines (either fixed or flexible) are installed to each outlet port. Each such lubricating unit can serve up to 12 bearings.

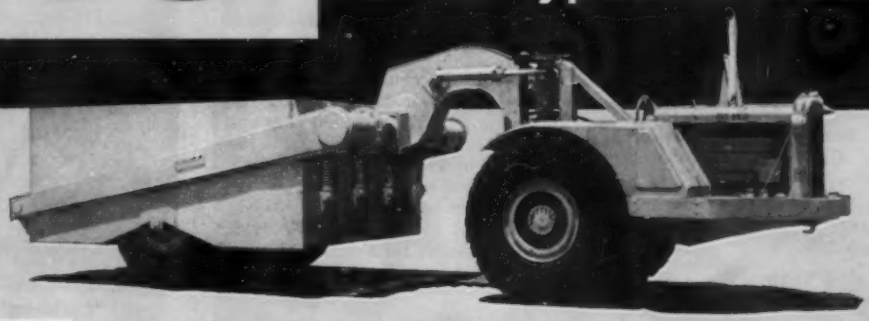
The luber is actuated automatically with each application of the air brake. In this process, the outlets are contacted individually and progressively so that every bearing is assured a metered amount of lubricant. A broken line to

(Continued on page 160)



GMC Air-Suspension Tractor

BIG Southwest Compaction Equipment for all types of tractors



BIG Southwest Compaction Rollers

BIGNESS MEANS SPEED when earthmoving and compaction is the problem. These big, multiple-box rollers are made in five sizes ranging in weight capacity from 10 to 100 tons. **Single Box Compaction Rollers** are also available in two sizes with weight capacities up to 100 tons.

BIG Sheepsfoot Rollers

RANGING FROM 5 TO 20 TONS in weight capacity, there are six models of Southwest Rollers featuring full oscillating double drums and two-piece feet with replaceable tips.

BIG Southwest Rippers

IT'S A GIANT that weighs 25,000 lbs. Is built to penetrate to depths of 36", 42" or 48". Special center standard can be furnished to go 60" deep.

BIG Southwest Sprinkler Tanks

5000 TO 7500 GALLONS is the capacity of these big semi-trailer type Sprinkler Tanks. Have front, rear and under-tank spray bars. Get the facts about these big units; write for bulletins today!

Southwest Welding & MANUFACTURING CO.
CONSTRUCTION MACHINERY DIVISION
ALHAMBRA, CALIFORNIA

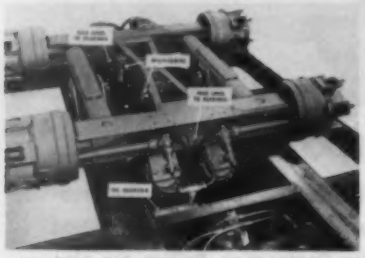
. . . for more details circle 326, page 16

What's New in Equipment and Materials

(Continued from page 158)

one bearing or a loose bearing has no effect on the total volume of lubricant delivered to the other bearings and movable parts.

"Multi-Luber" is available on all new LaCrosse low-bed trailers from 8 to 75-ton capacity. For further information write to La Crosse Trailer Corp., La Crosse, Wis.



"Multi-Luber" on LaCrosse Trailer

For more information circle 126 on Service Coupon Page 16 and mail now

Light Weight 3-KW Generator

Homelite Portable Generator

Close voltage regulation and generous overload capacity are among features combined in the new low-cost model 41 gasoline engine generator just announced by Homelite, Port Chester, N.Y. This 3000-watt generator was developed for use by contractors, builders, plumbers and electricians to provide dependable power for floodlights, portable electric tools and emergency standby service.

For more information circle 127 on Service Coupon Page 16 and mail now

Asphalt Curb Builder

The Miller Spreader Corp., 4020 Simons Road, Youngstown, Ohio, has introduced an automatic asphalt curb extruder called the "Curbilder." It is available in two models: the "Twin-Form," MC-200, and the "Mono-Form," MC-100. Both models carry the same specifications but differ in that the "Twin-Form" has two compacting chambers while the "Mono-Form" has only one.

The machine is designed to place curb at extreme edge of pavement or within 1 in. of any wall or obstruction. Compaction ranges from 90 percent to

"Curbilder" in Action

110 percent. The curbilder requires one operator to ride and steer it and two loaders. Motor exhaust cleans and heats surfaces ahead of the curb form. "Twin-Form" model MC-200 paves either right or left and may be loaded from either side of hopper.

For more information circle 128 on Service Coupon Page 16 and mail now

"Our hammer mill proved it—

Only Colmonoy No. 1 hard-facing lasts so long, costs so little!"

Colmonoy No. 1 hard-facing stands up under rough conditions involving impact and abrasion. Its cost is moderate and it welds easily. Great on equipment like dozer blades, shovel teeth, crusher rolls, and conveyor parts.

The new low-hydrogen coating provides excellent arc stability and makes weld cleaning between successive passes unnecessary. You can use it on vertical surfaces, too. Colmonoy No. 1 deposits are hard: 58 to 63 Rockwell C.

Write today for more information about Colmonoy No. 1 and the rest of the Colmonoy line of hard-facing alloys.

HARD-FACING ALLOYS

WALL COLMONOY

19345 JOHN R STREET DETROIT 3, MICHIGAN

BIRMINGHAM • BUFFALO • CHICAGO • HOUSTON • LOS ANGELES
MORRISVILLE, PA. • NEW YORK • PITTSBURGH • MONTREAL • GREAT BRITAIN

Available as 3/32, 1/8, and 1/4-inch diameter electrodes (DC), in 10 and 50 lb. metal containers.

. . . for more details circle 338, page 16

New Model in Truck Mixer Line

Construction Machinery Co. of Waterloo, Iowa, announces the addition of the new model 550 "Transcrete" to its line of truck mixers. Drum volume is 243 cu. ft., with a mixer rating of 5½ cu. yd. As an agitator it is rated to carry 6 to 6½ yd. of concrete. The unit is available with optional Ford or Chrysler separate engine power or with the CMC truck engine drive. It has the established "Transcrete" features, including floating drive, swing-out hopper and a favorable center of gravity. All regular accessories are available.

The addition of the 550 to the "Transcrete" line gives a choice of 5 sizes, and permits the selection of a machine to give maximum payload under the various weight restrictions in different areas.

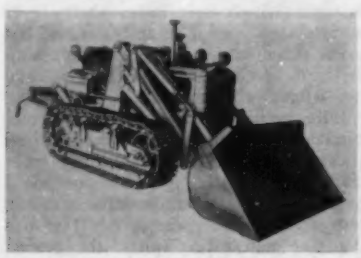
CMC's Model 550 "Transcrete"

For more information circle 129 on Service Coupon Page 16 and mail now

Complete Tractor-Loader Unit

Many major operating improvements are claimed by Oliver Corp., 400 W. Madison St., Chicago, Ill., in their new 1½-yd. tractor-loader unit, including low silhouette mounting with 20 percent lower side pedestals than former models, affording 360-degree vision. Low center of gravity results in unusual stability, permitting a quicker, fuller loading cycle.

The heavy frame of this machine, designated the OC-126, is rigidly mounted for extra loader strength. Track frames are fixed stationary to the frame. Full-length steel guards protect the five lower track wheels and track assembly by keeping out stones and gravel. Oliver "Power-Turn" gives the loader 2-track power at all times, even on turns. Power is a 53-hp diesel or gasoline engine.



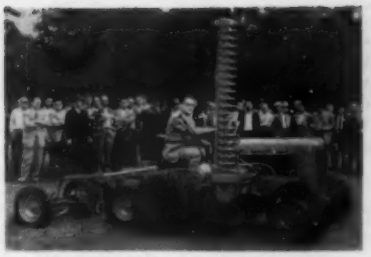
Oliver Tractor-Loader

For more information circle 130 on Service Coupon Page 16 and mail now

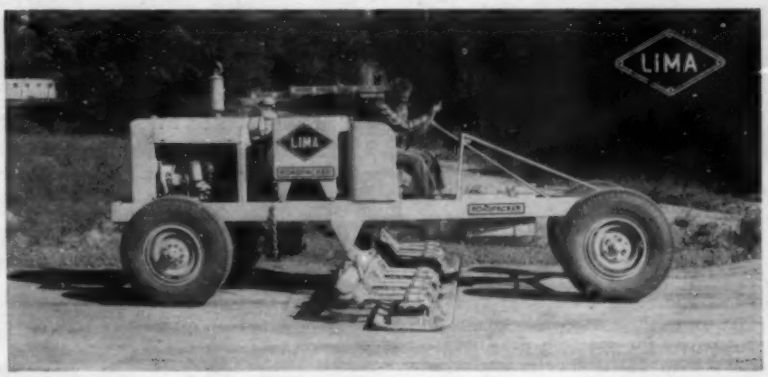
Mowing Unit on Tractor

The Worthington Mower Co., Stroudsburg, Pa., manufacturer of gang mowers and tractors for large area grass maintenance, has just announced a new three-gang mowing unit for use with its Model "G" tractor.

Known as the "Park-Over" attachment, the new mower is built as an integral part of the tractor. It carries three 30-in., reel-type mowers with either steel or pneumatic-tired ground wheels. Cutting swath is 7 ft. A hydraulic lift raises all cutting units for rapid transportation from one location to another. The "Park-Over" is adapted for side-hill mowing and has been used on slopes as steep as 25 degrees with excellent results, it is stated.



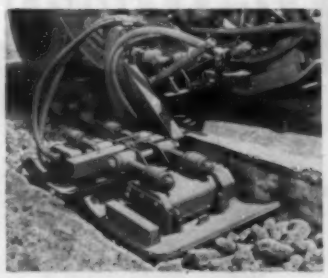
Mower Attachment and Sickle Bar



Cut your high-density compaction costs with the LIMA ROADPACKER

Macadam Bases—Coarse aggregate for bases up to 12 in. thick can be spread in a single layer, then uniformly compacted to final density by the Roadpacker over a 13 ft., 1 in. width. This single course construction, possible only with vibrators, reduces spreading time by half. Also it eliminates the need for backtracking all the equipment for the second pass; and contour shaping is done once—instead of twice. In waterbound work, the Roadpacker's tamping and vibrating action runs in screenings solid from top to bottom. Only three spreads of screenings are required, and much of the hand labor of spreading, brooming and rolling is eliminated.

Gravel Subbases and Soil Cement Bases—Specified density is obtained in one to three passes, depending on material and depth. Because the Roadpacker compacts equally well traveling forward or in reverse, there's no deadheading when two or more passes are needed. Vertical packing action prevents troublesome shoving on difficult materials and does not drift the spread down on super-elevations.



Widener Attachment—Vibrating shoes compact material in widening trench while Roadpacker runs on existing pavement. Easily adjusted for various width trenches.

ROADPACKER FEATURES

- **Low maintenance**—*Rugged vibrator shoes are pressure lubricated and actuated hydraulically through a completely sealed system. There are no exposed moving parts, no oil levels to check, no breather holes through which oil can escape.*
- **Fast and maneuverable**—*Highway speeds up to 28 mph, reverse speeds up to 7 mph. Steers easily. For work in tight places, can be operated with only four shoes. Shoes can be folded up easily and need not be removed from machine.*
- **Easy to operate**—*Operator is above dust, away from engine heat and exhaust for maximum comfort and efficiency. He has excellent visibility . . . controls are readily accessible.*

Get all the facts on the new Lima Roadpacker— write for your copy of the Roadpacker bulletin today.

DISTRIBUTORS IN PRINCIPAL CITIES OF THE WORLD

LIMA ROADPACKER

BALDWIN-LIMA-HAMILTON
Construction Equipment Division — LIMA WORKS

OTHER DIVISIONS: Austin-Western • Eddystone • Electronics & Instrumentation
Hamilton • Loewy-Hydropress • Madsen • Pelton • Standard Steel Works

. . . for more details circle 245, page 16

When equipped with a hydraulic sickle bar, the tractor-mower combination can mow short grass or tall weeds without any changeover. The reel-type cutting units of the "Park-Over" or the hydraulic sickle bar can be used at the same time or separately, as desired.

For more information circle 131 on Service Coupon Page 16 and mail now

Tractor-Drawn Scrapers

International Harvester Co., 180 N. Michigan Ave., Chicago, Ill., announces its "4S-85" tractor-drawn scraper of 20 cu. yd. heaped and 16 yd. struck capacity, and the "4S-55" with 14-yd. capacity heaped and 10 yd. struck. With side boards these capacities are varied

Harvester's "4S-85" Scraper

to 22 yd. and 19 yd. for the "4S-85" and to 15 yd. and 12 yd. for the "4S-55".

The "4S-85" is matched in weight and capacity for use with the International 200-hp TD-24 crawler tractor, or a unit with similar hp; the "4S-55" is constructed to team with a machine with the power of the 105-hp TD-18 crawler tractor.

The new type cutting edge on the scraper blades consists of three interchangeable, reversible segments which permit the operator to shift to one of three cutting depths to match soil conditions and boost loading efficiency. Other claimed advantages are close "ground-hugging," low draft arm connections, outside-mounted apron arms, and roll-out ejection. Double ball bearing sheaves assure accurate sheave alignment, provide increased cable and sheave life.

For more information circle 132 on Service Coupon Page 16 and mail now

Power Take-off Truck Mixer

New 5 to 7-cu. yd. "Mixomatic" truck mixers featuring front engine power take-off with "Fordomatic" transmission are announced by Willard Concrete Machinery Co., 11700 Wright Road, Lynwood, Calif. Four discharge speeds provide flexibility of concrete flow. Two levers, throttle and transmission, simplify the controls. Two-speed gear box and take-up drive chain are easily accessible for maintenance. Other features are a new hopper for faster charging, 3-way quick shut-off water valve, and splash guards from fender to frame for drum protection. Standard automotive parts are used in the drive line. Total weight of the 7-cu. yd. unit is approximately 6800 lb.

Willard "Mixomatic"

For more information circle 133 on Service Coupon Page 16 and mail now

Tungsten Saw Tooth Core Bit

The new tungsten carbide insert Saw Tooth core bit just announced by Hoffman Bros. Drilling Co., Punxsutawney, Pa., is said to provide reduction in initial investment plus greatly increased footage speeds. This bit, cutting like a saw, operates on the conventional rig to bring up extremely smooth cores. It has been extensively tested in the field, according to the company.

Hoffman Bros. Core Bit

For more information circle 134 on Service Coupon Page 16 and mail now

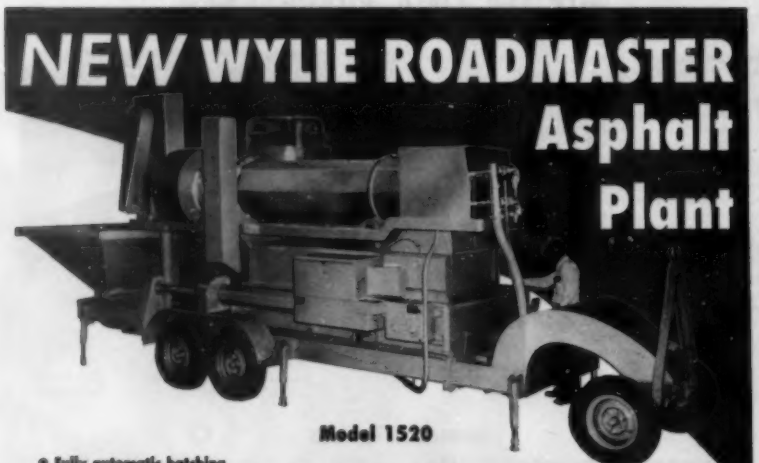
Semi-Automatic Transmission

To fulfill transmission requirements of highway trucks, the "StepMatic" a new semi-automatic heavy duty transmission which minimizes shift lever and clutch pedal manipulation has been developed by the Transmission Division of Clark Equipment Co. Falahee Road, Jackson, Mich.

The mechanism is an integrated combination of a 5-speed synchronized transmission and an auxiliary gear train. The auxiliary unit is composed of a direct and an underdrive gear set, semi-automatically engaged. The underdrive gear ratio "splits" the geared steps of the transmission, thus giving ten closely spaced gear ratios.

(Continued on page 170)

NEW WYLIE ROADMASTER Asphalt Plant



Model 1520

- Fully automatic batching and asphalt metering cycle
- Rotary dryer with forced draft
- Twin-shaft pugmill with enclosed oil bath gear box
- Enclosed bucket elevator and reciprocating feeder
- 400 gallon asphalt tank
- Cyclone type dust collector

★ 15-20 Tons Hourly Capacity

★ Completely Mobile

The "1520" meets the demand for a complete self-contained, mobile plant, ready to operate in minutes right at the jobsite. Available also as a skid-mounted unit, with gasoline, diesel or electric power. The Roadmaster is the machine asphalt users have been waiting for — the asphalt plant that has *everything*.

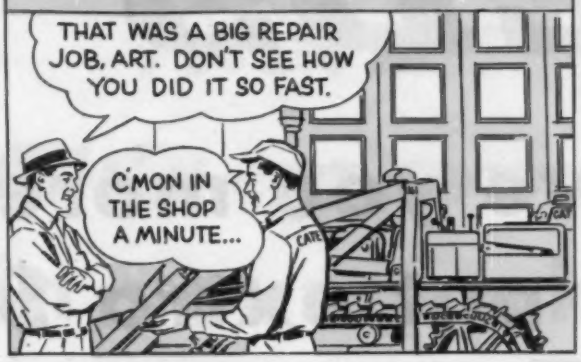
Wylie Asphalt Equipment

Send for new 8 page, illustrated brochure

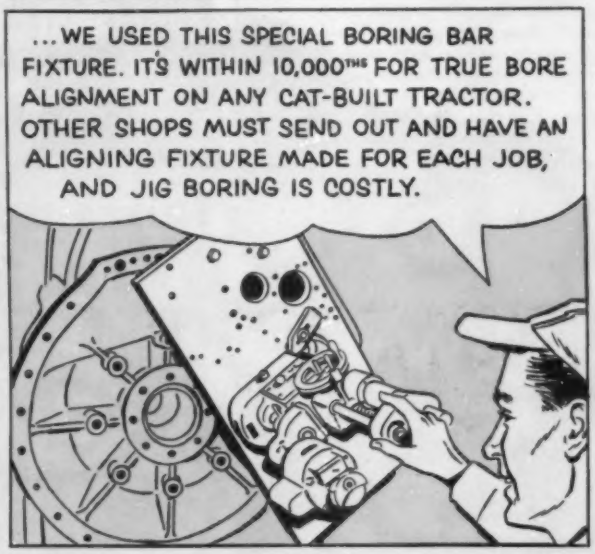
WYLIE MANUFACTURING CO., INC.
P. O. Box 7086 Oklahoma City 12, Okla.

. . . for more details circle 347, page 16

THE CASE OF THE
TOOL THAT BUILDS EXTRA WORKING HOURS



WE'RE SET UP WITH DIFFERENT WORK AREAS, AND WITH SPECIAL TOOLS AND EQUIPMENT FOR DIFFERENT JOBS.
IT'S A NEAT LAYOUT, ALL RIGHT!

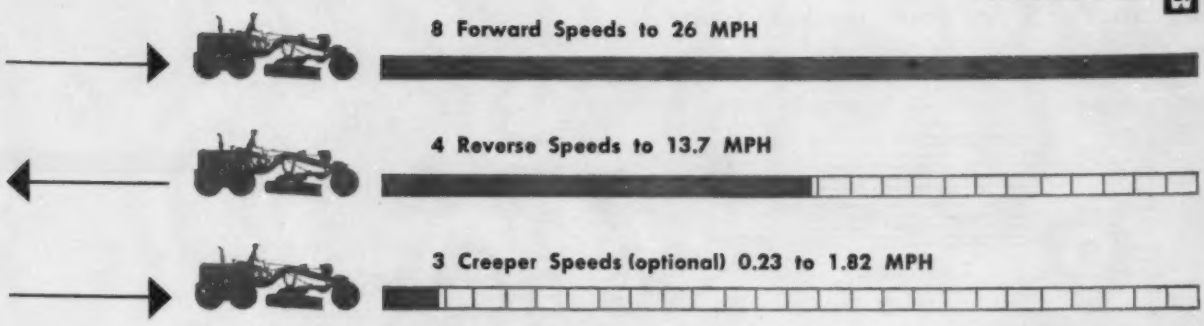

...WE USED THIS SPECIAL BORING BAR FIXTURE. IT'S WITHIN 10,000™S FOR TRUE BORE ALIGNMENT ON ANY CAT-BUILT TRACTOR. OTHER SHOPS MUST SEND OUT AND HAVE AN ALIGNING FIXTURE MADE FOR EACH JOB, AND JIG BORING IS COSTLY.

CATERPILLAR*
*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.
CAT CARE FOR LONGER WEAR
LET ME HELP KEEP YOUR CAT* EQUIPMENT ON THE JOB!
Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

. . . for more details circle 356, page 16

Adams* 15 SPEEDS

...give you more to put extra $



GO-power in your pocket

Profit ... that's what you work for ... and that is what you expect from your investment in earthmoving machines.

Every yard of extra material you move ... *at no increase in cost* ... puts extra dollars in your pocket. And if you move *more* material ... at even *lower* cost ... you're better off than ever!

You can expect *better-than-ever* results from modern Adams motor graders. Leveling fill, cutting ditches, shouldering, mixing, maintaining ... with these rugged, high-speed machines you'll do more work, in less time, and make more profit.

John M. Rufo, Vice President of Rufo Construction Co., Boston, Mass., says, "When slow steady blading is needed, the Adams works slow without sacrifice of power. When fast secondary passes are made, no other machine can touch its speed. It definitely has greater pushing ability ... practically eliminates the need for a bulldozer on a road graveling job."

You get up to 28% bonus blade-work

The 8 forward speeds in Adams graders give you up to 28% bonus blade-work. For example, an Adams 550, working alongside other graders in the 115-125 hp class, takes a big cut, pushes a full blade of dirt, at 4.6 mph. Other graders do not have this speed. When full power is needed, they have to shift down to the next lower gear, 3.6 to 4.0 mph ... work 1.0 to 0.6 mph slower than the Adams. By comparison, on jobs requiring extra *GO-power*, the Adams produces up to 28% more work. This extra production is FREE, because Adams 8-speed transmission costs no more.

Your heavy-duty Adams gets to the job sooner, and works later, because it travels at speeds to 26 mph ... an advantage of nearly 5 mph over other graders. This saving can mean about 10 minutes a day. If translated in extra work time, it can mean 4 days' bonus production for you in a year's operation.

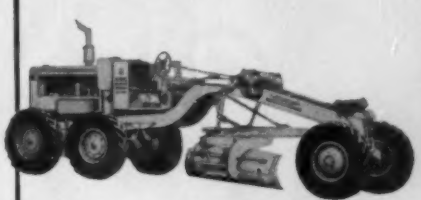
Works always at fastest practical speed

With 8 forward speeds, 4 reverse speeds, and 3 creeper gears (optional) ... a total of 15 speed ranges ... your Adams operator can work his machine always in the most practical gear. The result is more work done, more jobs completed on schedule, *more $ in your pocket.*

You get up to 27% more production on shuttle grading

Most graders have only reverse gears, with speeds to 7 mph maximum. Adams has 4 reverse gears ... 2 for blading, 2 for high-speed back-up, ranging to 13 mph. You need these high reverse speeds to cut non-productive time on shuttle operations. The Adams backs up to its starting point fast, converts otherwise wasted reverse travel time to extra passes and profitable production.

Compare Adams to a grader having top reverse speed of 6.3 mph. On a 400′ forward operation, with each grader moving at 4.5 mph, the blading pass takes 61 seconds. Backing to the starting point, the Adams reverses at 13 mph, returns in 21 seconds — the other grader reverses at 6.3 mph, returns to the beginning of the cut in 43 seconds. The Adams *saves 22 seconds* on each 440′ cycle. No matter how long the cycle, at these speeds the Adams can make 27% more cycles ... do 27% more blade work ... return bigger profits on your investment.

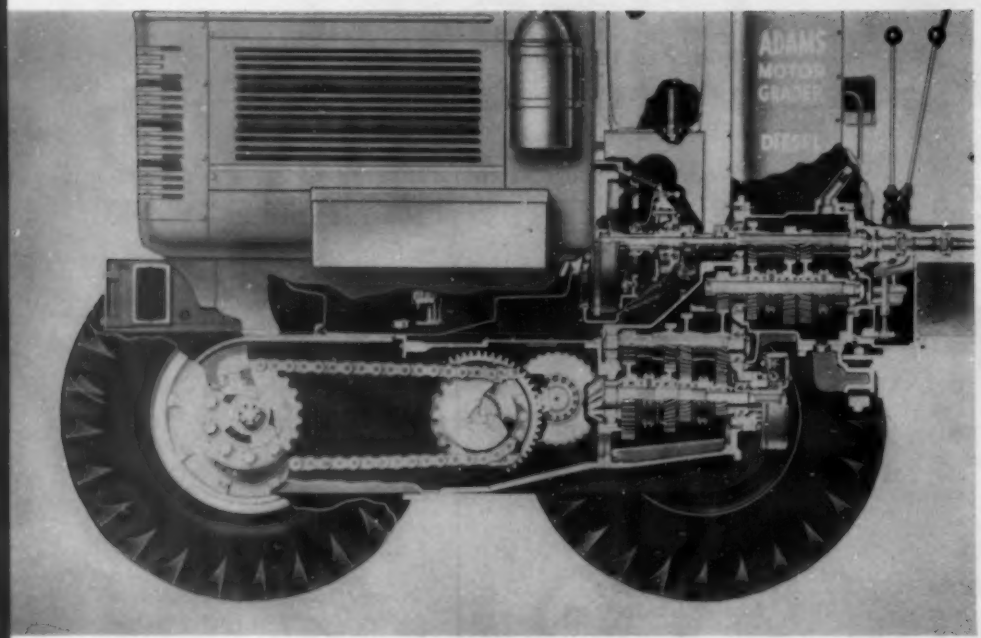


NOTE: Speed ranges mentioned here apply only to Adams heavy-duty Models 660, 550, 440, and 330, with constant-mesh transmission. Other models include the big 190 hp POWER-*Flow** 660 with torque converter, and the 60 hp utility Adams Model 220 with hydraulic controls.

*Trademark

turn page for more on **GO-power**

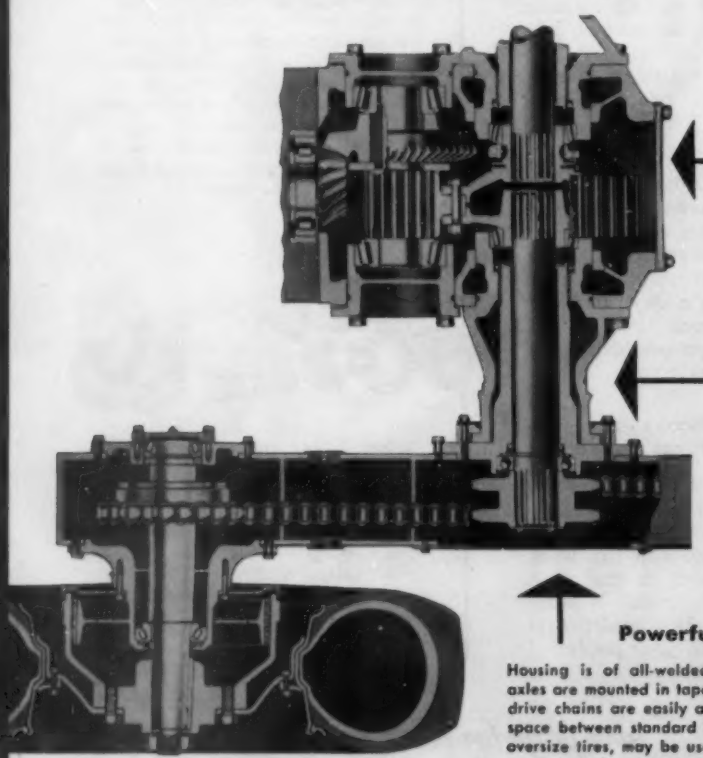
. . . more $ in your pocket (cont'd)



Designed and built for hard work and high efficiency, this heavy-duty constant-mesh transmission is available only in Adams graders. Precision-cut, helical gears are crown-shaved for true mesh and quiet operation. Shafts and gears turn on ball-, needle-, and roller-bearings. There are no bronze bushings to bind with heat and wear. All moving parts in both upper and lower transmission cases are fully lubricated with individual oil supplies.

GO-power . . . in heavy-duty final-drive with full-floating rear axle

Engine GO-power is transmitted quietly through the Adams constant-mesh transmission and husky final-drive to full-floating drive axles. There is practically no friction . . . no power loss. In this construction, maximum power is delivered from engine to tandem drive-wheels. You get greater GO-power . . . greater operating efficiency . . . more work done! And your Adams grader retains its high-operating efficiency over more years of tough service under all working conditions.



Absorbs load shocks

Heavy gears and bearings assure long life. Bull gear hub is mounted in heavy-duty roller bearings for permanent support and alignment. Housing is extra heavy to withstand torsion and load shocks.

Axle carries no weight

Sturdy, tubular-shaped axle carrier housings connect transmission case with tandem case, on each side of grader. Housings carry all the weight . . . permit tandem wheels to oscillate freely. Driving axle floats on anti-friction bearings.

Powerful tandem drive

Housing is of all-welded box-type construction. Large driven axles are mounted in tapered roller bearings. Long-lasting roller drive chains are easily adjusted for tension. There is plenty of space between standard tires and tandem case. Tire chains, or oversize tires, may be used without danger of binding.

100%

anti-friction drive gives you top efficiency...more *GO-power* ...puts extra $ in your pocket

One reason why Adams* heavy-duty graders give you more *GO-power* is because these carefully-built machines deliver a greater proportion of developed engine-power to drive-wheels. You get this bonus work-power because all gears and shafts in transmission, final-drive, and tandems turn on smooth-running anti-friction bearings.

Because the Adams power-train has anti-friction roller- and ball-bearings throughout, minimum horsepower is lost through friction. *More thrust* is made available for pushing bigger loads . . . for blading deeper . . . *working faster*. And with this efficient anti-friction drive your fuel cost is correspondingly lower. You get longer bearing life, less maintenance expense, less downtime for repairs . . . more usable power at less cost . . . to take advantage of the wider speed ranges available in Adams motor graders.

"When you hit something solid you don't tear-up this grader!" That's what owner F. M. Moyer, of Moyer Construction Company, Staunton, Virginia, says about his Adams 550, equipped with creeper gears. Mr. Moyer was building 6.2 miles of 24' roadway for the new State Highway 635, linking Hume, Va., with U.S. Route 522, to the west. Here his "550" worked with a spread of other machinery, for the Virginia State Department of Highways.

On this job the Adams grader sloped banks, cut ditches, elevated curves, and bladed surface; grading an average of 1,000' of roadway per day. Ordinary work was handled in 1st and 2nd gears (2.2 and 3.2 mph). Where rock was encountered, the operator shifted to one of 3 creeper gears . . . using *full engine-power at speeds as slow as 34 ft. per minute (.39 mph).*

Commenting on the Adams grader, owner Moyer said, "I especially like two things about my grader . . . the power-shift moldboard, and creeper gears. Particularly like the creepers, because they give you full horsepower at slow travel. When you hit something solid, you don't tear-up the grader. Foot accelerator is very handy, too."

turn page for more on ***GO-power***

*Trademark

. . . more $ in your pocket (cont'd)

POWER-*Flow 660**

190 hp diesel engine† and torque converter. Infinite gear ratios, with forward speeds to 27.4 mph, reverse to 24.4 mph. Power is always matched to load for greatest efficiency. Biggest, fastest grader in the Adams line. Weight, 30,200 lbs.**

6 high-speed with GO-power

Somewhere in this Adams line-up is a grader of the right power and weight to handle your work with greatest speed and economy. To help you decide, let us send complete details and specifications. And for conclusive proof of Adams' ability to increase your profits, ask your LeTourneau-Westinghouse Distributor for a demonstration. No obligation! Call or write today.

Model 220

60 hp diesel, with hydraulic controls. Gives big-grader performance at low investment. An ideal tool for light maintenance and construction, grading between forms, leveling around foundations, spreading topsoil, and for building driveways. Weight, 15,000 lbs.**

Model 660

An extra-heavy-duty machine with 150 hp diesel engine†. A big grader, with power and stamina to keep ahead of your heavy hauling units, leveling fill. Weight, 30,050 lbs.**

Model 550

Heavy-duty, all-purpose tool, with 123 hp diesel engine†. Has the power and speed to outproduce any grader in its class. Use it anywhere to your profit. Weight, 26,320 lbs.**

Model 440

A sturdy, general-purpose grader, with 115 hp diesel engine†. Ideal for haul-road maintenance and clean-up, but heavy enough to do good work terracing, smoothing shoulders, and leveling fill. Weight, 24,080 lbs.**

**Weights shown are usual working weights.
†Choice of General Motors or Cummins diesel engines.

Adams* graders

to put extra $ in your pocket

. . . for more details circle 297, page 16

Model 330

A high-speed worker in the 80 hp class. Used widely for finish leveling and spreading in light construction, and for general maintenance. Diesel engine†. Weight, 23,020 lbs.**

Elegrader

Plows and casts material, or loads into trucks. Side-casts 700 to 1500 cu. yds. per hr.; loads into trucks 400 to 800 cu. yds. per hr. Driven by PTO. Available for use with Adams 660, 610, 550, 440, Caterpillar No. 12, and Adams POWER-Flow 660 grader models.

*Trademark AG-1433-G

LeTourneau-WESTINGHOUSE Company, PEORIA, ILLINOIS

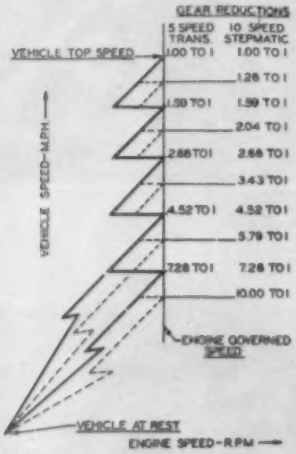
A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

What's New in Equipment and Materials

(Continued from page 162)

Regardless of the gear in use, the truck driver can obtain additional gear reduction and power immediately by "floorboarding" the accelerator or by



Clark Transmission Characteristics

pushing a button as arranged to suit the truck builder's option. The auxiliary automatically returns to direct driven when accelerator pedal is relaxed. The driver does not require a high degree of shifting skill to keep the truck "highballing" in the face of rapidly changing road conditions.

The ten-speed unit is currently available in two sizes, Model 303-X rated for engine torque output of 300 lb-ft, and the 400-X, rated for 425 lb-ft.

For more information circle 140 on Service Coupon Page 16 and mail now

Utility Blade Extensions

Arps Blade with Extensions

End extension pieces for utility blades, bringing the overall width of the blade to 8 ft., have recently been announced by the Arps Corp., New Holstein, Wis. The extensions add 1 ft. to each end of the blade and are contoured to fit the Arps models AB-6 and AB-7 blades. They are equipped with reversible cutting edges. Simple blotted connections make them easy to attach and remove. Adaptable to most makes of tractors.

For more information circle 141 on Service Coupon Page 16 and mail now

Portable Batching Plant

Features and improvements in the new "Port-O-Matic" truck-mixer batching plant of Erie Strayer Co., 912 W. 12th St., Erie, Pa., are listed as follows: (1) Easy to set up and take down. Do either in 6 to 8 hours; (2) All bin compartments in 100-yd unit. No dual installations; (3) Wheel-mounted conveyor. Easily moved into place; (4) Materials automatically weighed. One-man operation; (5) Capacity, up to 160 cu yd per hour; (6) No foundations needed. Any level surface will do. Mud sills and column supports do the job; (7) Quick disconnect plug and socket type electric connections; (8) Easily and economically complete in 4 sections. Specially designed for quick set up and take down.

For more information circle 142 on Service Coupon Page 16 and mail now

Erie Stayer's "Port-O-Matic" Plant

Hydraulic Ladder Ditcher

Gar Wood Industries, Inc., Wayne, Mich., has equipped its model 160 ladder-type ditcher with new hydraulic controls. Designed for water main and deep sewer excavation, the ditcher is now equipped with a hydraulic boom hoist for fast, positive positioning by means of an independent, package-type hydraulic control system. No friction boom clutch or brakes are required. The 160 digs to a depth of 16 ft. with widths from 18 to 48 in., and, with its boom, can work close to buildings, utility poles and other obstructions. Reverse digging speeds allow undercutting of sidewalks and pipes.

Gar Wood Ditcher

For more information circle 143 on Service Coupon Page 16 and mail now

Backhoe Digs 12 Feet

The new Henry Backhoe Super C-10H digs 12 ft. deep with telescopic boom, 10 ft. with special boom. Both models load 8½ ft. high. Both telescopic and special models are available with either hydraulic or manual out-

Henry Backhoe

riggers to level the machine for straight down digging even on a 25 percent slope. Henry's ground-gripping feature is retained; the main frame resting on the ground, so that there is no backhoe weight on the tractor while digging. Both booms swing 160 degrees and will dig from any angle within that arc.

Henry Manufacturing Co., Inc., Topeka, Kansas.

For more information circle 144 on Service Coupon Page 16 and mail now

More Equipment News on Pages 16, 40, 150

Heaped loads up to 25 cu. yds. were easily handled in fast time by this DW21-No. 470 Lowbowl Scraper for L. G. Arnold, Inc. Other Caterpillar-built units in the company's line-up include a D9 used as pusher; one non-current DW21; two D8s; two No. 12s; one D6 with tamper; one D7 with Bulldozer and a No. 80 Scraper.

"OUTPRODUCED BY FAR ANY OTHER MACHINES ON THIS JOB"

Phil Dudenhoefer, grade foreman, L. G. Arnold, Inc., Eau Claire, Wisconsin

CAT* Lowbowl Scraper, push loaded by a D9, set the following pace on relocation of U. S. 53, Wisconsin:

1. Averaged 12 to 15 minutes a trip with heaped loads on a three-mile round-trip haul.

2. Loaded sandy gravel in 70 seconds and topsoil in 45 seconds.

Here's more proof that Caterpillar Lowbowl Scraper design really pays off on the job. The proof comes from F. L. Carr, Vice-President, and Phil Dudenhoefer, grade foreman, of L. G. Arnold, Inc.

Quoting F. L. Carr: "The new DW21 and D9 pusher have more than lived up to all of our expectations. The lowbowl design of the new scraper has even improved the easy loading feature of Caterpillar-built hauling equipment."

Quoting Phil Dudenhoefer: "In my 28 years in this business, I've seen all sorts of earthmoving machines, and Caterpillar beats them all. As grade foreman, I've got both feet right down in the dirt where I observe and record the output and performance of every machine. I'll say this: the DW21 and No. 470 Lowbowl Scraper with the D9 pushing outproduced by far any other machines on this job!"

The job: The relocation of about 10 miles of U. S. 53 between Eau Claire and Chippewa Falls, which involved the handling of 78,059 cu. yd. of borrow (sandy gravel), 42,901 cu. yd. of unclassified and 93,272 cu. yd. of overburden (topsoil). The Caterpillar DW21-No. 470 Lowbowl Scraper (struck capacity 18 cu. yd.), carrying heaped loads up to 25 cu. yd., made four trips an hour on a three-mile round-trip haul. Loading time, with the D9 pushing, averaged 70 seconds for sandy gravel and 45 seconds for topsoil.

On job after job, under varying conditions, the Cat Lowbowl Scraper is showing its heels to other earthmovers. Your Caterpillar Dealer, who backs you with prompt service, will be glad to show you *facts* and *figures* comparing its performance with other units.

For *proof* that it will pay you to put DW21-No. 470 Lowbowl Scrapers on your job, see him today!

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

WANTED—
THE HARD WORK

. . . for more details circle 257, page 16

here . . . without a doubt . . . is the most useful buying catalog in your office

. . . and here are some reasons why you should be USING IT DAILY!

- Catalogs are PREFILED — Saving you time and space required to file individual manufacturers' catalogs.
- Saves you the time and inconvenience of writing to manufacturers for catalogs.
- Gives you all the facts needed BEFORE you make a buying decision.
- Manufacturers' names and trade names indexed alphabetically for quick reference to individual catalogs.
- All the buying information is 'boiled down' — designed for your convenience.

After checking the advantages listed above, you can see why this ONE CATALOG offers you so MANY advantages . . . saving you both time and money, not only in the mechanical and physical aspects of a cataloging operation . . . BUT MOST IMPORTANT OF ALL . . . it is available WHEN you NEED it . . . BEFORE you make your buying decisions! The manufacturers represented in this catalog are literally 'meeting' with you in your office — offering you all the information you could possibly need concerning their products. Why not meet them at least half way — and USE THEIR PREFILED INFORMATION!

Here are the manufacturers represented in Gillette's Heavy Construction Prefiled Catalog:

Acker Drill Company, Inc.
American-Marietta Company
American Steel & Wire
Anthony Company
Armco Drainage & Metal Products, Inc.
Arrow Manufacturing Company
Austin-Western
Baldwin-Lima-Hamilton Corp.
Barber-Greene Company
Blaw-Knox Company
Briscoe Manufacturers of California
Bros Boiler & Mfg. Company, Wm.
Buffalo-Springfield Roller Company
Butler Bin Company
Carey Manufacturing Company, The Philip
Childers Manufacturing Company, Inc.
Chrysler Corporation
Clark Equipment Company
Cleaver-Brooks Company
Cleveland Formgrader Company, The
Cleveland Trencher Company, The
Colorado Fuel and Iron Corp., The
Concrete Sawing Equipment, Inc.
Construction Products Sales
Continental Motors Corporation
Cummer & Son Co., The F. D.
Cummins Engine Company, Inc.
Detroit Diesel Engine Division
Dart Manufacturing & Sales Co.
Erie Strayer Company
Flexible Road Joint Machine Company, The
Flintkote Company, The
Gar-Bro Manufacturing Company
General Motors Corporation
Gledhill Road Machinery Company, The
Goodall Rubber Company
Gunderson-Taylor Machinery Company
Hurnischfeger
Heil Company, The
Heltzel Steel Form & Iron Company, The
Hensley Equipment Company, Inc.
Hough Co., The Frank G.
Huber Warco Company
Ingersoll-Rand
International Harvester Company
Jackson Vibrators, Inc.
Joy Manufacturing Company
Madsen Works
Mid-Western Industries, Inc.
Miller Tilt-Top Trailer Company
Minneapolis-Moline
Naugatuck Chemical
Owen Bucket Company, The
Pacific Car and Foundry Company
Phoenix Products Company
Pioneer Engineering Works, Inc.
Pippin Construction Equipment, Inc.
Presstite-Keystone Company
Republic Steel Corporation
Rogers Brothers Corporation
Seaman-Andwall Corporation
Seaman-Gunnison Corporation
Servicised Products Corporation
Shawnee Manufacturing Company, Inc.
Stow Manufacturing Company
Symons Clamp & Mfg. Company
Timken Roller Bearing Company, The
Toncan Culvert Manufacturers Association
Tampo Manufacturing Company
United States Motors Corporation
United States Rubber Company
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Bituminous ROADS AND STREETS

● Construction in progress for a parking lot at Salinas, Calif. Sprinkler truck is being followed by a pulverizing mixer, mixing in an all-purpose grade of asphalt emulsion. One of five uses made by this city of emulsion materials. Thomas Dunn, Superintendent of Maintenance.

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State Practices in Bituminous Concrete

MAY, 1957

Peter Mortensen examines engine and blower for low-pressure burners on a newly acquired Etnyre Hauling Tank.

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VIEWS AND COMMENTS

By H. G. Nevitt

The Challenge

The declaration of the Air Force that asphalt pavements built for their bombers were unsatisfactory, with the decision to confine the construction of airports for this special duty to rigid type pavements for the present, is a real challenge to the asphalt industry. Analysis may indicate some of the steps needed to correct this situation.

The facts involved in the matter are very much in dispute: it appears that this sweeping indictment of asphalt construction is probably not justified by the facts, considering design, objectives versus actual exposure, possible preventive maintenance, and other factors. Nevertheless, asphalt will not prosper in an atmosphere of dispute and explanations. Certainly pavements cannot be expected to carry loads far beyond those designed for: but there should be some leeway in the application conditions and similar. Furthermore the design technique should not (if possible) produce a pavement which not merely cannot be appreciably overstressed, but also needs the design loadings to keep in good condition, as may be the situation with the very lean mixes proposed as a remedy for the pavements under criticism in this instance.

That satisfactory pavements for this duty cannot be built is not, we believe, the expressed opinion of the Air Force, and certainly not that of the U.S. Corps of Engineers. The proper attitude is simply that design must progress sufficiently to assure a satisfactory result—although the design objectives set up must be reasonable and realistic. Certainly asphalt technologists have no reason for pessimism on the possibilities of asphalt for the most severe duty.

• *Observation of pavements* under the heaviest type of use, such as army tanks, has always been favorable to the asphalt type, with its greater ability to adjust itself to and transmit stresses. It is our own view that asphalt pavements can be built to the strength available from the aggregate itself—a limitation equally inherent in the rigid type. However, economical design that will assure such strength is something else.

If the fault does not lie in basic limitations of asphalt construction, it must arise from one of three possible causes, or some combination thereof. The first is a lack of knowledge of design requirements to make possible the needed results. The second is the failure to utilize such knowledge, if available, through the selection of an improper design method. The third is failure to actually build the pavement to the standards called for by the design.

• *We doubt if the blame* can be placed on the last-named possible cause. Generally speaking, the quality of inspection and control on Armed Forces airport construction is as good as (if not better than) that usually found in highway work. Unfortunately this is far from saying that the Air Force's field control will assure a uniform pavement to the highest standards possible, because completely effective controls are today either lacking or extremely infrequent.

Viewed as a manufacturing operation, the construction of bases and pavements is not accompanied by the control techniques and standards which have been worked out for similar operations in industry. This point has received considerable discussion in recent years. Satisfactory procedures will undoubtedly be adopted in time, but few structures of this type can be said today to carry the same assurance of quality standards that can be expected from a large variety of manufactured articles. At the same time the troubles to be expected from this lack of optimum control are hardly sufficient to account for the unsatisfactory experience of the Air Force we are discussing.

As regards the first possible cause —i.e., the lack of a sufficiently fundamental approach to assure correct design—we have been pointing out for the last few years, perhaps with annoying frequency, that the design methods currently in wide use are not realistic. The test results of prepared specimens on which the design is based fail to meet the requirements of a truly rational design on at least two counts:

• *The first is that* the compacted specimen, taken to represent the pavement being tested to determine its load bearing potential, does not duplicate the structure which will actually be built, because the compaction method used does not duplicate that caused by traffic.

The second is that the forces applied to test the strength of such specimens do not simulate those actually encountered in use. The compactive effort provided by traffic —from the standpoint of final results one of the most effective compacting devices available today —consists of repeated relatively low stress applications applied in such fashion that there are horizontal and other components which produce orientation.

Furthermore, the pavement or base consolidated under these conditions lacks the unyielding side support present in laboratory compaction. The result is failure of the laboratory specimen to duplicate the actual pavement in structure.

Likewise, the stress applied to this specimen does not duplicate the continued repetitions of relatively light stress applications resulting from traffic. It takes little consideration to realize the wide gap existing between the laboratory procedures on which most designs are presently based, and the actual stresses and resistances encountered in the final structure. It is really surprising that these current methods have given as good results as they have. This is primarily because traffic applications have only recently become intensive.

• *Steps can be taken* to correct both of these situations. Much work has been done, both in the past and recently, on repetitive stresses. All that is needed is to continue these studies and apply them to a practical design approach. Laboratory compaction is likewise susceptible of analysis; suitable methods to duplicate with inexpensive equipment the compactive effort encountered in actual use should not be difficult to develop. In brief, design can be made realistic by carefully simulating the construc-

tion and stressing of the actual structure, as soon as technologists recognize the degree with which current methods fail to do this satisfactorily, good though they may be compared to our past situation.

Two other points may likewise require attention. The structural resistance of a pavement, and likewise the strains or permanent deformation accompanying stressing, are very much dependent upon the degree of compaction existing at the time. If the design procedure assumes a final compacted condition but such is not built into the road at the time of construction, there is no assurance that failure will not occur during the intervening period between the construction compaction and that finally achieved by traffic. This is particularly true where channelized traffic is to be encountered, and the observation applies to bases as well as pavements.

● *Stated in another way,* if the asphalt content, degree of compaction and such are all based upon a certain final or critical structural condition—and they certainly should be—the construction compaction should, for complete safety, produce this final condition. This has rarely been done in the past, primarily because, in the case of widely distributed traffic, it has not been necessary. Where, however, such random traffic cannot be counted upon, it is quite possible that assurance will have to be provided that the entire structure is sufficiently compacted before it is turned over to traffic which reflects the design maximum.

The other caution possibly required is that the asphaltic binder fully meets the job requirements—a situation which has not been too important up to now. This binder serves two functions. First, it must provide the lubrication required to permit compaction to the extent that the full frictional support of the densely graded aggregate, properly proportioned, may be developed. This is obviously a requirement met by the proper grade selection, with due consideration to other needed factors and not otherwise dependent upon asphalt source or quality.

But the binder must likewise provide the cohesive films which then mobilize these interlocked aggregate particles against movement under the stresses to be encountered.

This latter property has not only been not measured, but has been almost disregarded; the tacit assumption has been that asphalts commonly used in heavy traffic construction, and meeting the usual specifications there-of, have this property to an equal—or at least necessary—degree. And some believe that this cohesive resistance is purely a viscosity effect, since some laboratory work (which did not duplicate road stresses) does indicate this—a theory which we strongly question. It is true that, up to now, a pavement built to normal design standards requires so little from the binder in this respect to meet the demands of the traffic encountered that (with a few possible exceptions) any deficiency in this property among commercially used asphalts has not been noticeable.

● *It is nevertheless possible* that for loadings now being encountered (such as that under discussion in the Air Force), an excellent aggregate gradation will still be unable to carry the load without maximum cohesive assistance from the binder —though not necessarily one which we have up to this time considered ideal. It is also possible that all the asphalts now widely used will not be found to possess this property to the degree needed. If this possibility materializes, research in a more or less unexplored field will indeed be in order.

We do not wish to imply that these two possibilties are definitely with us. The evidence at Kelly Field appears to rule out the first as a source of trouble; no evidence on the second is available to even hint that it might be a matter for widespread concern.

We believe the preceding discussion tells the story on the second possible cause of failure; namely, the lack of use of a design technique which utilizes the available knowledge. Because this available knowledge is insufficient for, or at least has not been brought to the point of, an available rational design technique, no clear position can be taken on the approach followed. That is, there is really no sound basis on which to gauge its deficiencies, either as compared to the undeveloped ideal method or the others currently used and available.

● *Of course each technologist* has his personal views on this point. The Marshall method has been criticized as an unconfined compression test, providing merely one structural value when it has been clearly proven there are two parameters involved; those most widely referred to are the apparent angle of internal friction and cohesion. Such single value might obviously reflect both of the parameters, and not necessarily always in the same proportions. The judgment of these critics is that it too greatly reflects purely cohesion. The majority of its defenders have been content to base their position on its convenience, adaptability to field use, and its success up to the present difficulty. It does have another benefit presently lacking in the procedures claimed to be more scientific (in that they measure both the cohesion and angle of friction), namely, the measurement of flexibility or flow.

However, some studies indicate that the flow test simply provides the second parameter, measuring the angle of friction. It is our own belief that any final method will have to contain the benefits claimed for any of the competing approaches and clearly lack their disadvantages. Such final method must test a sample which is so prepared as to really duplicate the actual road structure and the tests applied to it will have to simulate those encountered by this road structure.

Finally, the design will have to take into account all the requirements placed upon the base and pavement.

● Among these are: (1) lack of failure under shear; and horizontal as well as vertical shear must be included; (2) the permanent deflections accompanying traffic must be within the degree found acceptable for the design demands; and, (3), the structure must be designed as a whole, with particular emphasis on the requirement of the pavement to not merely resist failure within itself but also to provide the full structural support to the base that will assure overall maximum load carrying ability.

Asphalt technology indeed faces a challenge. In our view it can be met by realistic recognition of the deficiencies of present design methods.

There is nothing in the picture which should prevent the development of rational methods if the facts are squarely faced. In brief, there is a job to be done.

State Practices in Bituminous Concrete

Bituminous road design and construction are far from standardized, notes this review, which for the first time reveals considerable progress toward standardization—but many inconsistencies remain.

By W. E. Chastain, Sr.

Engineer of Physical Research
Illinois Division of Highways, Springfield

Fifty highway agencies have cooperated in furnishing the information on bituminous-concrete practice that has been summarized. Cooperating agencies include all of the state highway departments, the District of Columbia Department of Highways, and the Ontario, Canada, Department of Highways.

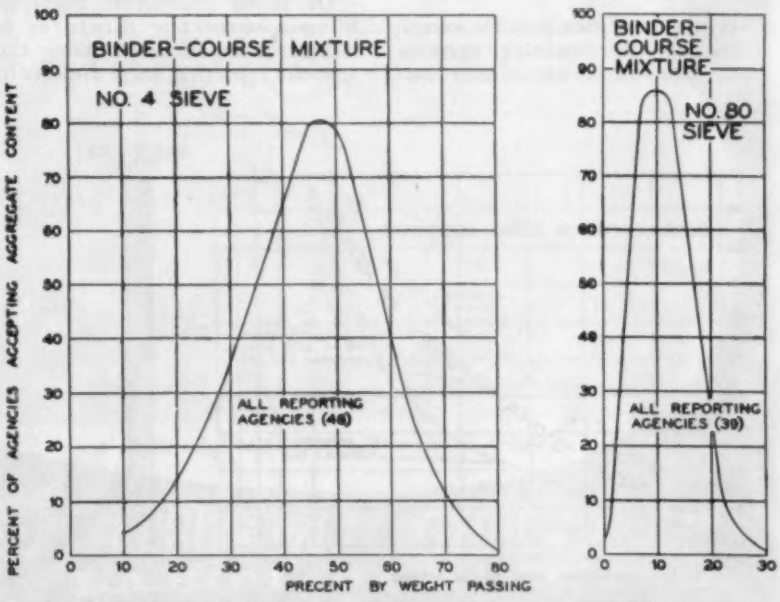
The information was assembled to serve as a basis upon which to pattern the construction of the experimental flexible pavement to be tested during the AASHO road test. A preliminary report of 1953 questionnaire returns was made at the 33rd annual meeting of the Highway Research Board in January, 1954. Tabulations of data were later submitted to all of the cooperating agencies for checking and for adding information to bring them up-to-date for 1954. The summary is therefore of 1954 practice.

The questionnaires, while applicable also to tar concrete, were definitely pointed toward asphaltic concrete, as more truly representing national practice and scheduled for use in the test road. However, much of the information that has been compiled applies to both types.

The questions asked may be placed in two groups: one dealing with standard specification requirements and the other with general practice not outlined in detail in specifications. This latter group covered procedures not normally covered by specifications (such as design procedures), and principal usage where specifications permit alternate usage, or are sufficiently broad to allow important variations in usage.

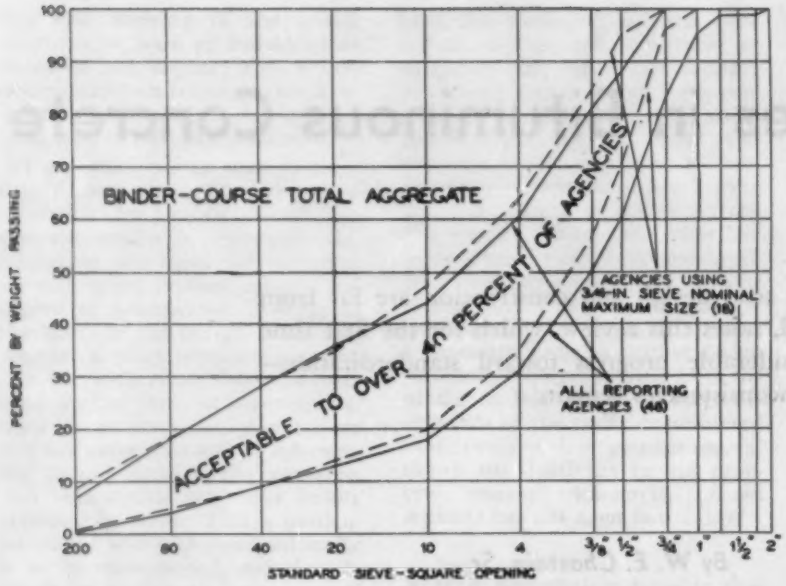
Scope of Questions

Among the items on which detailed information was received are: (1) gradation limits and other specifications used to control ag-



● **Fig. 1—Examples of frequency-of-acceptance curves prepared for percentages of aggregate passing each sieve.**

This article represents minor abridgments of a paper presented at the Highway Research Board annual meeting in January of 1957. Published herewith by permission of the author and the Board.


BINDER-COURSE TOTAL AGGREGATE
ACCEPTABLE TO OVER 40 PERCENT OF AGENCIES
AGENCIES USING 3/4-IN. SIEVE NOMINAL MAXIMUM SIZE (18)
ALL REPORTING AGENCIES (48)
PERCENT BY WEIGHT PASSING
STANDARD SIEVE-SQUARE OPENING

● Fig. 2—General acceptability to gradation of total aggregate.

gregates and mineral fillers: (2) tests, test limits and general practice in use of asphalt cements for bituminous concrete; (3) specification limits for mixture composition and typical compositions; (4) specifications for controlling the uniformity of mixtures; (5) design methods and test limits for bituminous-concrete mixtures; (6) construction procedures and controls; (7) equipment and equipment specfications; (8) tests performed on completed mixtures; (9) prime coats; and (10) pavement thickness design.

With one or two possible exceptions, all the reporting agencies make some use of bituminous concrete. Although wide variations in practice were occasionally found, particularly in the number of refinements that are introduced and in the degree of control exercised over mixtures, the basic mixtures and construction procedures were found to be surprisingly similar.

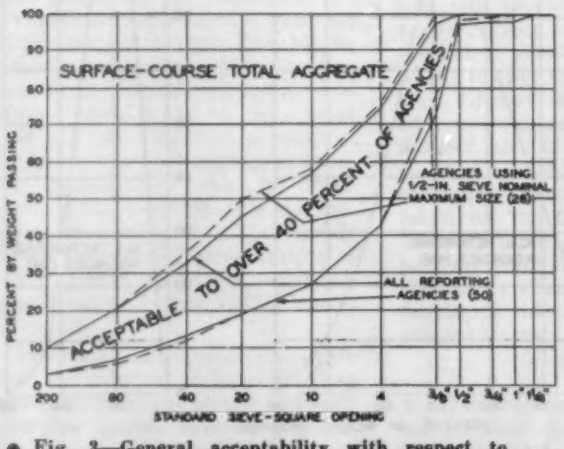
The entire report touches on all phases of bituminous-concrete practice covered by the questionnaires. The present discussion will point out only a few of the more interesting and more important findings of the survey.

Of prime interest to users of bituminous-concrete mixtures is mixture composition. Among the agencies reporting, there appears to be very good agreement as to the sort of a mixture that should be termed "bituminous concrete." Practically all of the agencies consider that such a mixture consists of an aggregate that is continuously graded from coarse to fine, a small percentage of mineral filler, and a content of asphalt cement that is controlled within narrow limits.

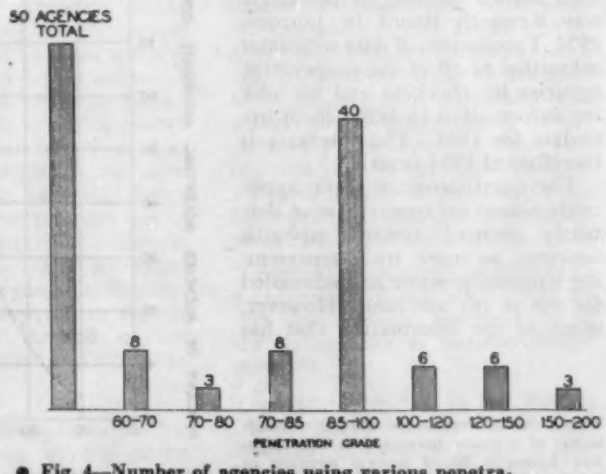
Particle Size

Gradation specifications outlining the general limits of particle-size distribution are expressed by the reporting agencies in three different forms: For binder-course material (48 agencies reporting), 33 use the percent-passing method, 12 use the passing-and-retained and three use the percent-retained. For surface-course material (50 agencies reporting), 32 use the percent-passing method, 15 use the passing-and-retained and three use the percent-retained method.

The passing-and-retained method of specifying gradation offers a direct means of preventing "skip" gradations and at the same time permits a relatively wide initial choice of mixtures. However, several (6) of the agencies using the percent-passing method achieve the same end by specifying minimum percentages of material to be retained between successive sieves. Apparently few agencies consider it economical to initially control gradations to the extent that little choice is offered at the beginning stages of mixture design. However most agencies require that a job-mix formula be devised, and adhered to within relatively narrow tolerance limits.


SURFACE-COURSE TOTAL AGGREGATE
ACCEPTABLE TO OVER 40 PERCENT OF AGENCIES
AGENCIES USING 1/2-IN. SIEVE NOMINAL MAXIMUM SIZE (26)
ALL REPORTING AGENCIES (50)
PERCENT BY WEIGHT PASSING
STANDARD SIEVE-SQUARE OPENING

● Fig. 3—General acceptability with respect to gradation of total aggregate.



● Fig. 4—Number of agencies using various penetration grades of asphalt cement.

To compare mixture compositions specified by the reporting agencies, it was first necessary to place all of the prescribed gradations on a common basis. The percent-passing basis was chosen for making this comparison because of the more common use of this method and also because of the greater ease with which gradations prescribed by this method may be plotted for visual examination. As is usually done, charts on semilogarithmic paper with a percentage scale on the vertical axis and the sieve sizes in logarithmic scale on the horizontal axis have been used for the comparisons. Percent-retained limits were converted to percent-passing limits by simple subtraction. Passing-and-retained limits were converted to percent-passing limits by a method described a few years ago in *Public Roads* magazine. In instances where the specified percentages were based on the total mixture, these were converted to percentage limits based on the total aggregate.

The limits of each agency were plotted to form the general gradation envelope, using straight lines to connect the plotted points. After all envelopes had been plotted, the percentage values were determined for all of the points at which the straight lines intersected the vertical lines of the semilogarithmic chart representing the more commonly used sieves.

From these limits the frequency of acceptance of the various percentage values passing each of the selected sieves was determined and plotted for all agencies. Examples of frequency-of-acceptance curves for two sieves are shown in Figure 1. These frequency-of-acceptance curves are typical of many that were plotted. It will be noted that they take the general shape of usual frequency-distribution curves. Although the complete range of percentage limits for a sieve is relatively great, there is still a very definite tendency toward concentration of acceptance within a relatively narrow range.

Gradation Envelopes

From the frequency-of-acceptance curves were developed gradation envelopes showing various concentrations of agencies with respect to acceptance of percentages of mineral aggregate passing the entire range of sieves. Examples of such envelopes for binder-course aggregates are shown in Figure 2. These envelopes show the limits of mater-

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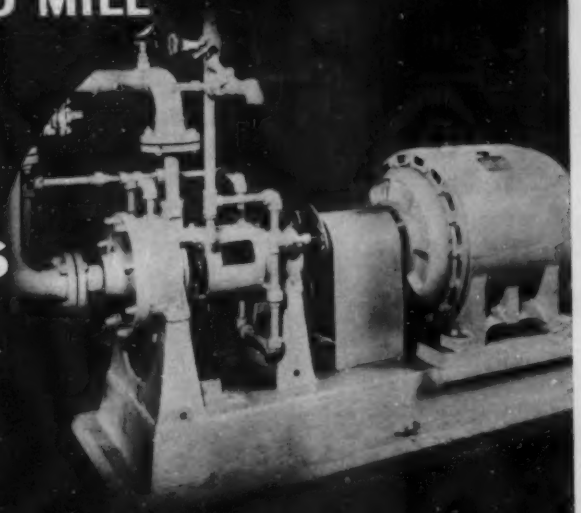

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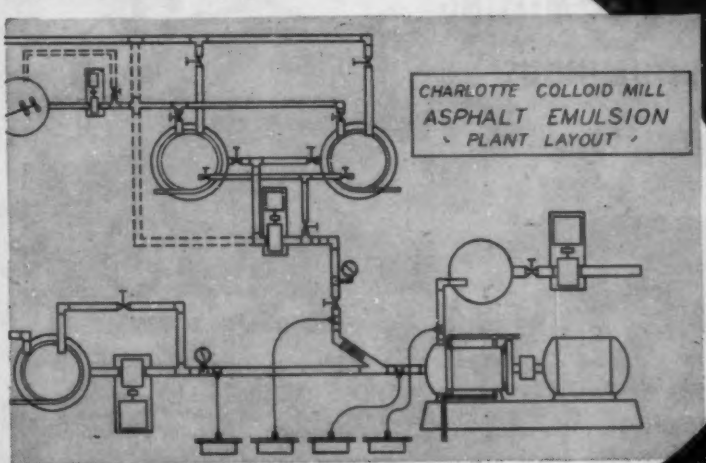

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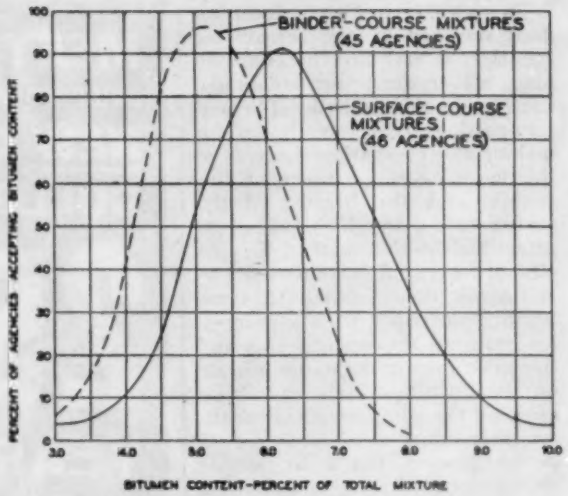
ial acceptable to over 40 percent of the reporting agencies. The solid-line envelope has been plotted for all agencies regardless of maximum-size limitations. The dashed-line envelope has been plotted for only those agencies using a ¾-in. nominal size of material. As would be expected, the gradation envelope becomes somewhat narrower at the upper end, showing a greater concentration of usage when maximum size of material is considered. Figure 3 presents similar information for surface-course total aggregate.

Asphalt Penetration Grades

Asphalt cements of a variety of penetration grades are used in the bitminous-concrete mixtures. This usage of asphalt is summarized in Figure 4. It will be noted from the figure that the great majority of agencies make use of 85-100 penetration asphalt. Other penetration grades are used to a considerably lesser extent.

The range of asphalt contents that are used in bituminous-concrete mixtures is not great. This usage is shown by means of frequency-of-acceptance curves in Figure 5. It will be noted from these curves, the solid line of which is for surface-course mixtures and the dash line of which is for binder-course mixtures, that usage is quite well concentrated within narrow limits. The fact that higher percentages of asphalt are usually used in surface-course mixtures rather than in binder-course mixtures is clearly demonstrated.


BINDER-COURSE MIXTURES (45 AGENCIES)
SURFACE-COURSE MIXTURES (46 AGENCIES)
PERCENT OF AGENCIES ACCEPTING BITUMEN CONTENT
BITUMEN CONTENT-PERCENT OF TOTAL MIXTURE

● **Fig. 5—Frequency of acceptance of percents of bitumen in total mixture.**

Another item of general interest is practice in the design of bituminous-concrete mixtures. Most of the reporting agencies use at least one of the special tests that are available as guides in designing for stability. Of 49 agencies reporting, only five indicate that no method other than trial and error is used in at least the preliminary determination of proper mixture composition with respect to stability. The usage of the various stability tests is shown in Figure 6. It will be noted that the most popular tests are the Marshall (20 agencies), the Hveem (12 agencies), and the Hubbard-Field (11 agencies). It will be further noted from the figure that many agencies use more than one of the tests as guides in designing satisfactory mixtures.

The ranges in test figures that are considered by the reporting agencies to be indicative of satisfactory mixtures are shown in Figure 7 for the tests receiving major usage. It will be noted that in this respect practice is quite variable and there is little standardization between agencies. However it should be noted that the ranges are listed without regard to the characteristics of the aggregates and bituminous materials contained in the mixtures to which they have been applied. Only nine agencies report that they include in their specifications requirements based on stability tests.

Density Requirements Vary

One of the items where practice is exceeding variable is in the choice of criteria for desirable density. Experience has shown that bituminous-concrete mixtures perform best

(Continued on page 182)

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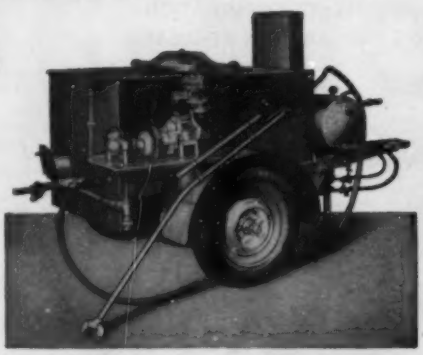

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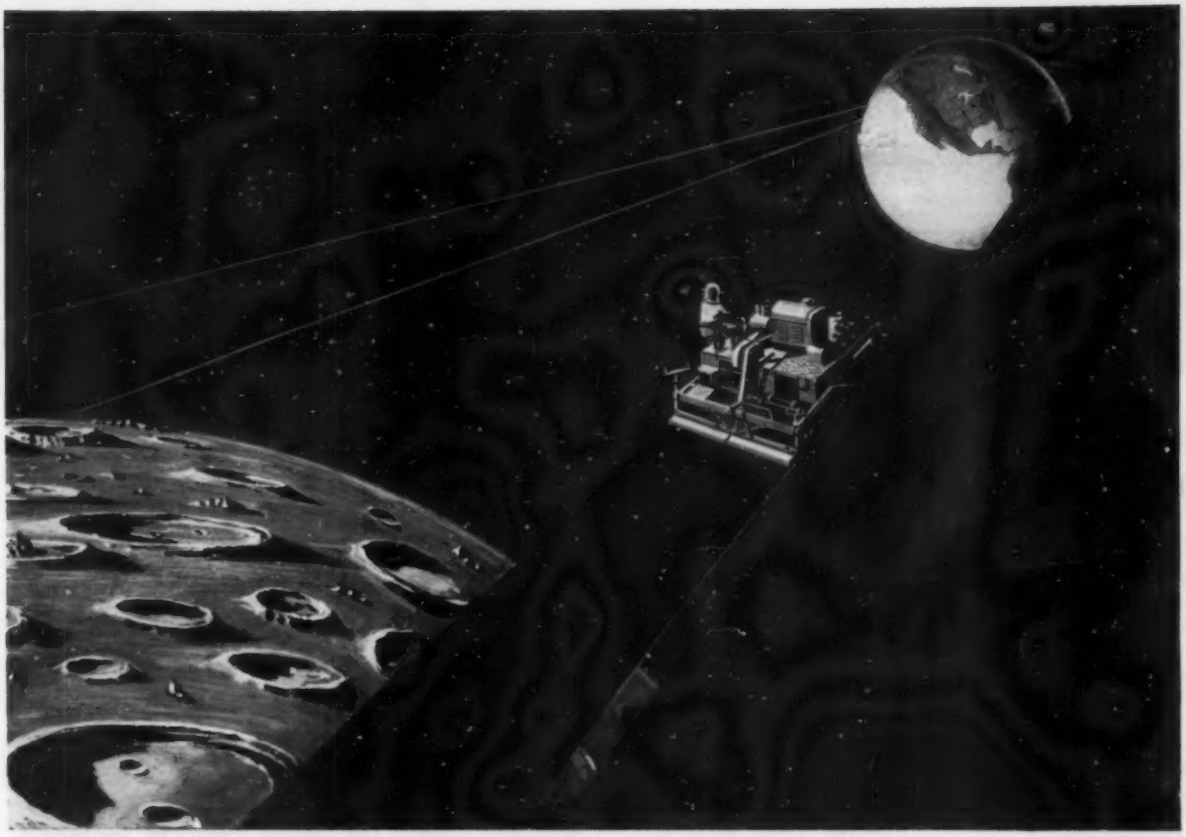

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STABILITY TEST	NUMBER OF AGENCIES	TESTS USED IN ADDITION TO THOSE LISTED IN FIRST COLUMN	NUMBER OF AGENCIES
MARSHALL	20	HUBBARD-FIELD HVEEM TRIAXIAL COMPRESSION	3 1 1
HVEEM	12	MARSHALL	1
HUBBARD-FIELD	11	MARSHALL IMMERSION-COMPRESSION	3 1
UNCONFINED COMPRESSION	2	IMMERSION-COMPRESSION AND VIBRATING TABLE	1
TRIAXIAL COMPRESSION	2	MARSHALL	1
IMMERSION-COMPRESSION	2	HUBBARD-FIELD UNCONFINED COMPRESSION AND VIBRATING TABLE	1 1
VIBRATING TABLE	2	UNCONFINED COMPRESSION AND IMMERSION-COMPRESSION	1
DIRECT COMPRESSION	1		
PRACTICAL EXPERIENCE-NO TEST	5		

TOTAL OF 49 AGENCIES REPORTING

● **Fig. 6—Usage of stability tests in designing bituminous-concrete mixes.**

BITUMINOUS PRACTICES

(Continued from page 180)

at a relatively narrow range of densities below a given voidless maximum. The maximum density to which compacted mixtures are usually referenced is a theoretical voidless density calculated through the use of specific gravity figures for the individual constituents of the mixture. If the aggregate absorbed no asphalt or if the voids within the aggregate particles became completely filled with asphalt, the choice of specific gravities for use in theoretical calculations would be a simple matter.

However, it is most common for the voids in the aggregate particles to become partially filled with asphalt. Therefore, specific-gravity figures that are used for aggregates are frequently a compromise. The questionnaire returns indicated that 19 agencies use ASTM bulk specific gravity for theoretical-density calculations, 14 agencies use ASTM apparent specific gravity, 5 use both to some extent, 3 use bulk specific gravity on a surface-dry basis, 2 use what they report to be an "effective" specific gravity, and 1 reports using a vacuum-saturated specific gravity.

With such a wide variety of usage of specific gravity in calculating theoretical densities, it is not surprising that there is a rather wide variation in the limits of relative densities that are considered as being desirable.

The use that is made of laboratory tests to control bituminous-concrete mixtures is also of considerable interest. The cooperating agencies were asked to report on the various tests that they make on samples taken from regularly-produced paving mixtures. They were also asked to indicate which tests are performed in the field laboratory, which in central laboratories, which are made on samples taken from trucks or at discharge from the mixer, and which on samples taken from the compacted pavement. It will be noted from Figure 8 that the majority of the reporting agencies make both on-the-job tests and central laboratory tests, both on samples of loose mixtures and on samples from the pavement.

From Figure 9 it will be seen that, for samples of uncompacted material, 38 agencies make on-the-job gradation tests, 26 make on-the-job extraction tests, 5 make on-the-job density tests, 5 make on-the-job Marshall stability tests and 8 make other miscellaneous tests.

For samples from the compacted pavement, 16 agencies make on-the-job gradation tests, 28 make on-the-job extraction tests, 14 make on-the-job density tests, and 4 make other miscellaneous tests.

Practice with repect to tests made in the central laboratory of samples of bituminous mixtures obtained on the job is shown in Figure 10. For samples of uncompacted material, 37 agencies perform extraction tests, 30 agencies make gradation tests, 7 make the Hubbard-Field stability test, 6 make the Hveem stability test, 9 make the Marshall stability test, and 7 use other miscellaneous tests. For samples from the compacted pavement tested in central laboratories, 28 agencies make the density test, 19 make an extraction test, 16 test for gradation, 4 make the Marshall stability test, 3 make the Hveem stabilometer test, 2 make the Hubbard-Field test, 4 make the Abson recovery test and 7 use other miscellaneous tests.

Thickness Design

In an effort to assemble some information on the thicknesses of flexible pavement that the reporting agencies would be likely to use under the conditions that prevail in the area of the test road, they were asked to indicate the thicknesses of the various pavement components that they would be likely to use if they were to design a pavement for the area. The natural soil was listed as an A-6 soil, the average annual rainfall was stated to be 32 in. and average annual frost

(Continued on page 184)

MIXTURE-DESIGN CRITERIA

TEST METHOD	TEST CRITERIA FOR ACCEPTABLE MIXTURES					
	NO TRAFFIC DIFFERENTIATION		MEDIUM TRAFFIC		HEAVY TRAFFIC	
	NUMBER OF AGENCIES	TEST LIMITS	NUMBER OF AGENCIES	TEST LIMITS	NUMBER OF AGENCIES	TEST LIMITS
MARSHALL STABILITY, LBS.	3 2 1 1	500+ 1000+ 1000 – 1500 1500+	2 1 3 1	500+ 600+ 1000+ 1200+	5 1	1500+ 2000+
FLOW, 0.01 IN.	1 1 3 4 1 1 1 1	12 15 – 16 – 20 – 8 – 18 10 – 15 12 – 18 12 – 20	1	12 – 20	1	8 – 18
DENSITY, % OF THEORETICAL	3 3 2 5	95 – 97 94 – 98 94 – 97 MISC.	(BASED ON BULK SP.G.) (VARIABLE PRACTICE IN DETERMINING SP.G.) (VARIABLE PRACTICE IN DETERMINING SP.G.)			
HVEEM STABILOMETER VALUE, %	1 4 1 2	30+ 35+ 40+ 35 – 50				
HUBBARD-FIELD STABILITY, LBS.	1 1	1500 3000+	1 1 1	1200 1500 3000 – 4500	1 1 1	2000 2500 3000

Figure 7.

Naugatuck Surfa-SEALZ

Let's build highways to last!

DETOURS can't be avoided while new highways are being built... but there *is* a way that promises to *keep* those highways in *good condition, longer,* once they are opened! That is by building them with a rubber-bituminous or rubber-asphalt surface course... using Naugatuck's SURFA-SEALZ® as the synthetic rubber additive.

Year by year, test sections of "rubber roads" throughout the country continue to confirm the promise of longer life and greatly reduced maintenance! Accelerated laboratory tests add further evidence of increased adhesion to aggregate and strength of binder under a wide range of temperature and aging conditions.

Experience has shown that admixture of only 8-9% of SURFA-SEALZ makes it possible to use a *softer* asphalt surface, since the rubber retains the natural oils instead of permitting them to bleed to the surface. This greatly postpones the time when embrittlement begins to cause cracking and the need for repairs.

SURFA-SEALZ is readily available in convenient form for admixture at the job... requires no special equipment... involves no complications... adds only slightly to initial paving costs! Isn't it time *you* started making use of its advantages?

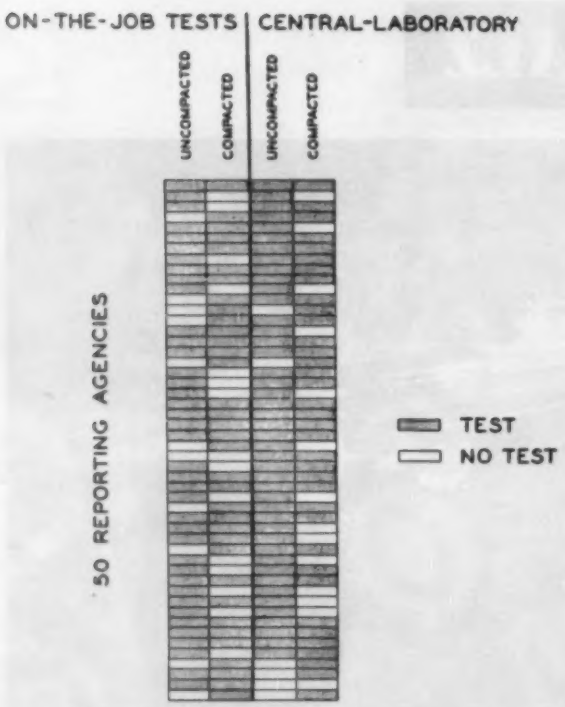
United States Rubber

Naugatuck Chemical Division

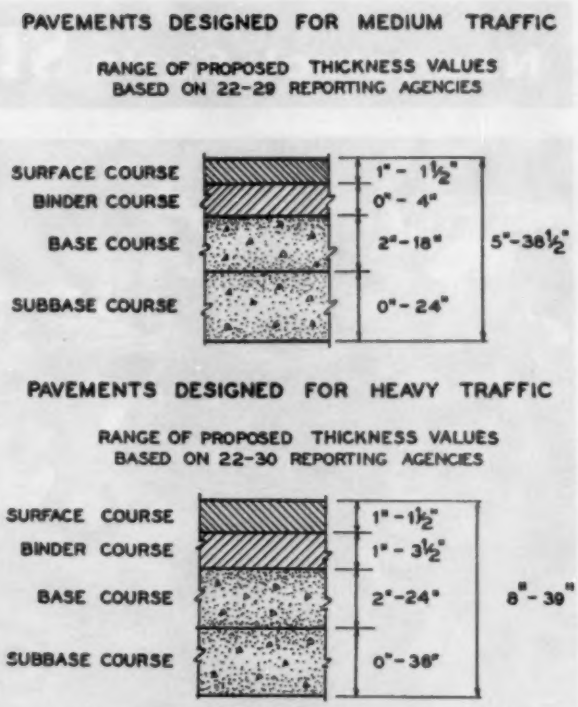
Naugatuck, Connecticut

BRANCHES: Akron • Boston • Chicago • Memphis • New York • Philadelphia • Mfg.: Naugatuck • Gastonia • Los Angeles • CANADA: Latex Div., Dominion Rubber Co., Ltd., Montreal • Cable: Rubexport, N. Y. Rubber Chemicals • Synthetic & Reclaimed Rubber • Plastics • Agricultural Chemicals • Latices

. . . for more details circle 310, page 16



● Fig. 8—Testing of bituminous mixture and compacted pavement samples obtained on the job. Majority make both kinds.



● Fig. 11—Flexible base thickness. Subgrade soil, A-6; average annual rainfall, 32 in.; average annual frost penetration, 28 in.

BITUMINOUS PRACTICES

(Continued from page 182)

penetration 28 in. They were also asked to furnish designs for medium and heavy traffic, providing their methods took traffic into consideration. As will be seen from Figure 11, the proposed total thicknesses and the proposed thicknesses of various pavement components vary widely. Proposed total thicknesses for pavements designed for medium traffic conditions varied from 5 to 38½ in. Proposed total thicknesses for pavements designed to carry heavy traffic varied from 8 to 39 in. As expected, the least variation occurred in the proposed thicknesses for the bituminous concrete.

It is believed that the wide variation in thickness as determined by the different design procedures in use is not attributable entirely to difference in the procedures. It is known, for example, that the information that was furnished concerning the subgrade soil was insufficient for many agencies (although it was all that was available at the time), and additional assumptions had to be made before many of the design procedures could be applied. Additional assumptions would be expected to cause a spread in the results. Other assumptions that were necessary, such as a more precise defining of the terms "heavy traffic" and "medium traffic," and perhaps in some instances the extrapolation in procedures not developed to cover the specified conditions of rainfall and frost, could be expected to cause further variation in the results.

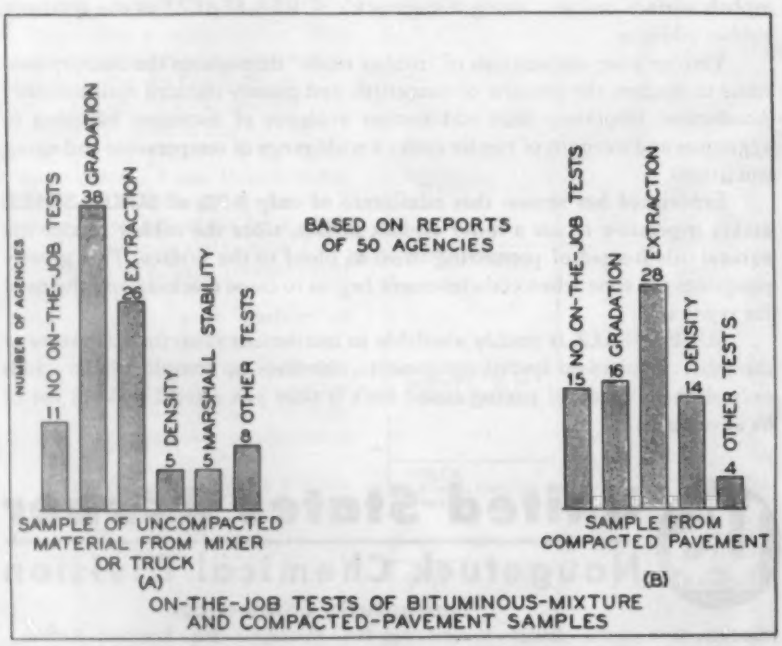


Figure 9.

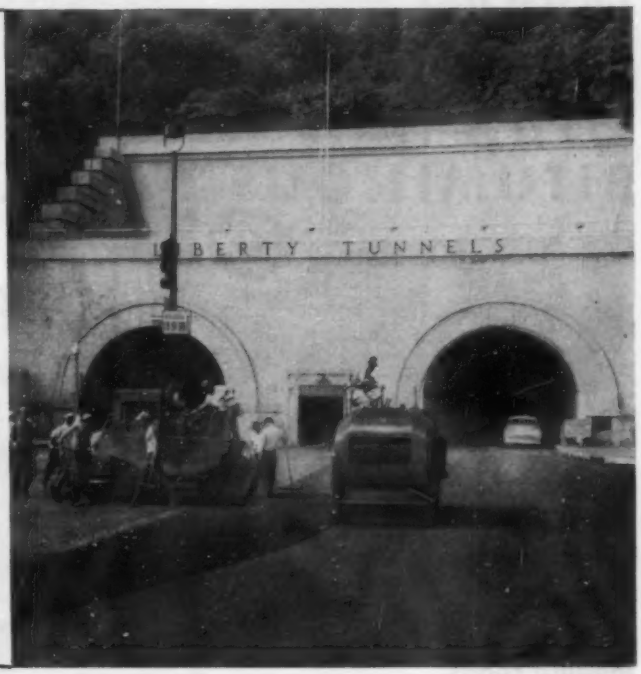
(Continued on page 194)

Nationwide service on Bitumuls & Asphalt for every paving need...all from one source!

PENNSYLVANIA: Laykold® Asphaltic Concrete solves a tough paving problem on the Liberty Bridge, a major approach to downtown Pittsburgh. (When it comes to pavements, bridges are notoriously "bad actors" because expansion and contraction of the deck result in an unusual degree of movement under the surfacing). Based on previous use of Laykold Asphaltic Concrete, Department of Public Work officials for Allegheny County knew that this material retained an extra measure of resilience after placement and compaction, with no decrease in load-bearing value.

Mixed with slag aggregate, a 120 lb. "LAC" binder course and a 100 lb. "LAC" surface course were placed over an area of some 32,000 sq. yds. Trumbull Construction & Asphalt Company of Pittsburgh did the work. American Bitumuls & Asphalt Company supplied the asphalt and the Laykold Tempering Fluid.

Results to date: excellent service; no pavement failures.



CALIFORNIA: Across the nation, on the Pacific Coast, the State of California Department of Highways let a half-million-dollar contract for re-surfacing 41 miles of U. S. Highway 99 to the Schroeder Company, of Sun Valley, California. For this job, American Bitumuls & Asphalt Company supplied: 1,700 tons of Air Refined Asphalt; 3,500 tons of Paving Asphalt; 140,000 gallons of Bitumuls® Emulsified Asphalt.

LOUISIANA: While "down South," on the construction of a road for private industry at Grand Isle, La., American Bitumuls & Asphalt Company supplied Bitumuls Emulsified Asphalt for 20,000 sq. yds. of 3-course surface treatment work on which *clam shells* were used as aggregate. As cover aggregate, shell produces a long-wearing surface.

Whenever . . . and wherever . . . your paving job calls for asphalt or asphaltic products, call our office nearest you. *That's your single source for all your asphalt requirements.*

American Bitumuls & Asphalt Company

200 Bush St., San Francisco 20, Calif. Perth Amboy, N. J.
Baltimore 3, Md. St. Louis 17, Mo. Cincinnati 38, Ohio
Mobile, Ala. San Juan 23, P. R. Tucson, Ariz.
Inglewood, Calif. Oakland 1, Calif. Portland 7, Ore.

. . . for more details circle 240, page 16

HIGH-SPEED
COMPACTION

LOW-COST
ROCK CRUSHING

EFFICIENT
BITUMINOUS SALVAGE

THE HYSTER "GRID" ROLLER DOES ALL THREE!

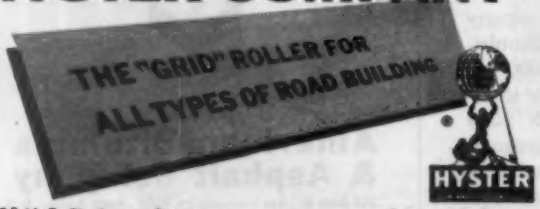
Here is the machine road builders all over the world are using on all types of road construction — free-ways, secondary roads, farm-to-market roads, access and logging roads.

Built for long life on any job—rock surfacing haul roads or high-speed compaction on expressways—the "Grid" roller is designed to give you low cost operation and maintenance. Its high capacity tapered roller bearings give long life. Its high-strength cast steel wheels resist wear in rock and abrasive materials. The heavy-duty frame prevents distortion in the toughest going.

"Grid" is the registered trademark for the Hyster open-surfaced roller. Caterpillar is the registered trademark of the Caterpillar Tractor Co.

For full details, call your Caterpillar-Hyster Dealer.

HYSTER COMPANY



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1895 North Adams Street . . . . . Peoria 1, Illinois
Portland, Oregon • Peoria, Illinois • Nijmegen, The Netherlands

1 EMBANKMENT COMPACTION — High-speed rolling (up to 15 MPH towed by Caterpillar DW15 Tractor) matches compaction with yardage of high-speed earth movers.

2 ROCK CRUSHING — Pit-run rock quickly and efficiently crushed for base and surface courses on secondary road construction and repair.

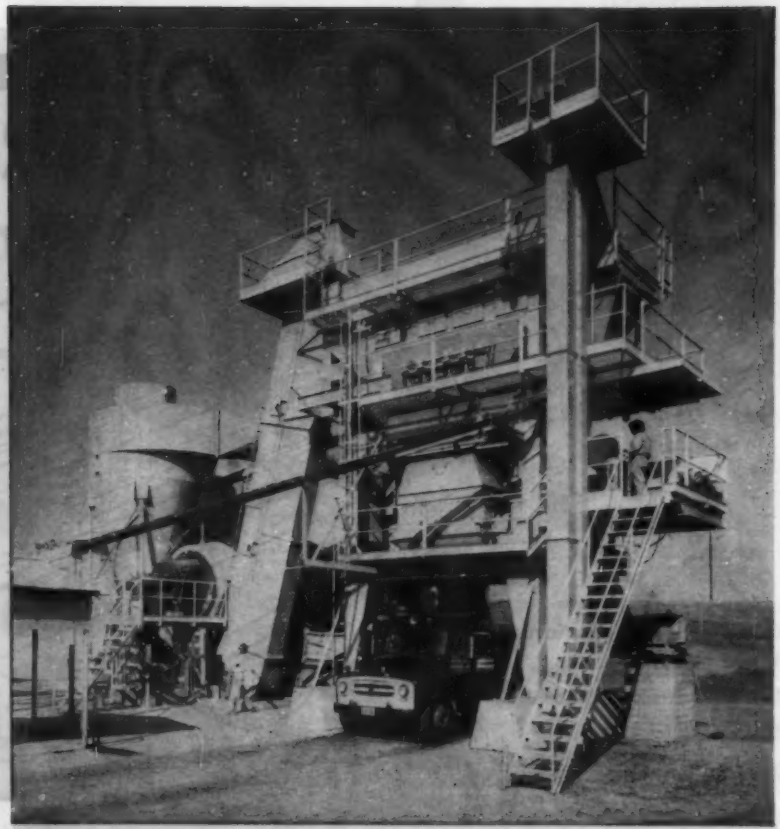
3 BITUMINOUS SALVAGE — Quickly breaking down old ripped-up mat, the "Grid" Roller salvages all of the original aggregate and reusable binder for use in new surface.

. . . for more details circle 286, page 16

"in the long run, we get MORE DOLLARS out of our MADSEN ASPHALT PLANTS"

Says . . .

R. C. (Bob) SULLY
Vice President
SULLY-MILLER CONTRACTING CO.
LONG BEACH, CALIFORNIA



Engineering Data . . .

Concerning Sully-Miller's 6000-lb. Madsen Asphalt Plant shown.

- **PLANT MODEL . . . Madsen Model 481 — 6000-lb. batch capacity.**
- **SCREEN . . . 48" x 16' Symons 2½ deck.**
- **DRYER . . . 96" x 30'.**
- **BURNER . . . 12" combination gas and oil.**
- **DUST COLLECTOR . . . 12' dia. cyclone and 65 tube multiclone.**
- **WET SETTLING EQUIPMENT . . . Madsen Triple Wet Tube Dust Washer-one 6' x 12' and two 6½' x 12' tubes.**
- **TYPE OF FEED . . . Tunnel to cold stone elevator.**
- **PLANT SET UP INCLUDES . . . dust elevator, dust bin and dust entering screw.**

MADSEN Equipment that Serves

Sully-Miller Contracting Co. is one of the largest suppliers of asphalt and asphalt paving in Orange County and southern Los Angeles County. Like other leading producers of asphalt, the prime concern of this contractor is to get big-volume, money-making production day-in and day-out from his asphalt plants. That's why he's mighty glad to have the MADSEN Model 481 6000-lb. plant, shown above, on the job. It's one of several MADSEN Asphalt Plants owned by this successful operator.

The sturdy, oversize construction of MADSEN Plants means greater *sustained* production. With our new MADSEN 6000-lb. Plant, Bob Sully says *"we can turn out approximately 2000 tons per day of close specification mix."*

The MADSEN Model 481 Asphalt Plant offers many superior engineering features. For example: the exclusive MADSEN bin design (patent pending) which eliminates segregation . . . fast, accurate, all-air operation of bin gates, asphalt pressure injection and mixer gate . . . oversize capacity weigh-box, roller mounted so that it may be quickly rolled out of the way for easy field maintenance . . . the famous MADSEN Model 440 Twin-Shaft Pug Mill Mixer with improved mixing action . . . and the patented MADSEN Pressure Injection System.

Whether you are an established operator or a newcomer in the asphalt business — you'll want to get all the facts on the MADSEN Model 481 Asphalt Plant. This outstanding plant is available in 4000-lb., 5000-lb. and 6000-lb. batch capacities to meet your needs.

Ask your MADSEN Distributor for Catalog No. 800 or write MADSEN Works.
Baldwin-Lima-Hamilton Corporation P.O. Box 38, La Mirada, California.

THE MADSEN LINE OF PRODUCTS
FOR THE ASPHALT PAVING INDUSTRY
INCLUDES

ASPHALT PAVING PLANTS • PUG MILL MIXERS • AGGREGATE DRYERS • DUST COLLECTOR UNITS
ROAD PUG TRAVEL-MIX PLANTS • WEIGH BATCHERS • SUPER FLOAT AND JOHNSON FLOAT FINISHERS
ASPHALT TANKS • ROYAL CROWN PUMP VALVES • ASPHALT AND FUEL PUMP UNITS

MADSEN WORKS
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CONSTRUCTION EQUIPMENT DIVISION
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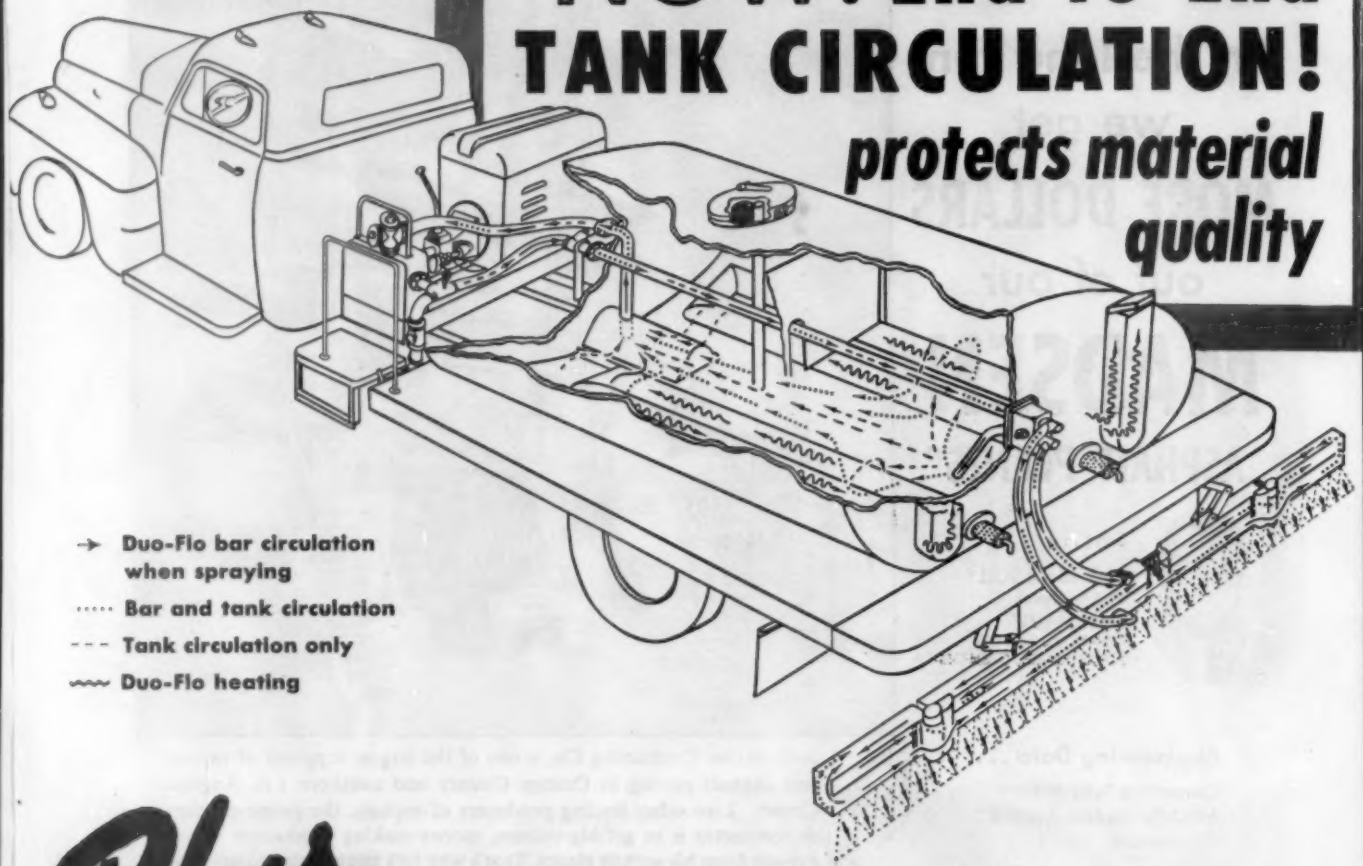
NOW! End-to-End TANK CIRCULATION!

protects material quality



Plus greatest operating simplicity and safety ever built into a bituminous distributor

Now you can get a bituminous distributor that *positively circulates material in the tank* for faster, more uniform heating. This new Seaman-Gunnison system eliminates local hot spots; there is less evaporation of solvents; less burning of bitumen residue and consequent less coking and nozzle clogging.

And, gone is the maze of rear-end piping! . . . eliminated by Seaman-Gunnison front-end pumping and control. Air-operated nozzles open or close in a *split-second*, while the Duo-Flo bar assures precise, uniform nozzle pressure and material application.

Write for free descriptive Bulletin No. 8, giving complete information. Use coupon on next page . . . Write today!

Safety front-end control

gives the operator a grandstand view of the spray bar, safely away from hazardous smoke and fumes. Cab control for complete one-man operation is optional.

Only one high production, high-quality design for bid buyer or road contractor

SEAMAN GUNNISON

After 800,000 cu. yd. compaction experience, Kramp Construction Company buys another DUO-PACTOR

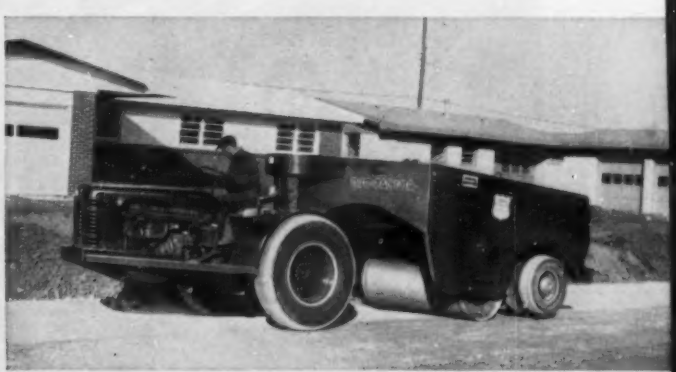
Based on an estimated saving of 50 per cent in compacting 16,000 cu yd daily with three Duo-Pactors, this prominent Milwaukee, Wis. contractor has bought another Duo-Pactor to start the 1957 season.

Contractors prove DUO-PACTORS obtain specified densities at LOWER COSTS!

Now, you can do ALL types of compaction with a single unit . . . the new Seaman-Gunnison DUO-PACTOR! Moreover, you can *save 50 per cent or more* in cost of compaction equipment. You easily meet compaction specifications. You slash operating costs. You save time with Duo-Pactor self-propelled, self-transporting mobility.

These savings result from the Duo-Pactor idea of combining small diameter steel roll and rubber tires to develop high compressive pressures. Vibratory roll and side-slope compactor attachments further adapt the Duo-Pactor to special requirements—literally giving you a *complete compaction and surface-rolling system* in one low-cost machine! Proof of Duo-Pactor savings: Contractors are now making repeat Duo-Pactor purchases to help beat the cost squeeze on 1957 contracts!

Barrus Construction Company, Kingston, N. C., "has found the Duo-Pactor most satisfactory. We have used it on streets, highways, air field runways and parking areas with excellent results."



Ritchie Brothers Construction Company, Wichita, Kan., reports: "We use the Duo-Pactor to do the work of three machines on rock base and seal coating. It's fast, and does a mighty good job."

Duo-Pactor is another development of Harry J. Seaman, pioneer in soil stabilization equipment and techniques for more than 20 years. Duo-Pactors and Seaman Duo-Flo Bituminous Distributors are manufactured only by Seaman-Gunnison Corporation.

. . . for more details circle 322, page 16

CORPORATION

- **Duo-Pactors**
- **Duo-Scrapers**
- **Duo-Flo Bituminous Distributors**

Seaman-Gunnison Corporation,
Dept. RS-5, 2763 S. 27th St., Milwaukee 15, Wis.

Please send me full information about

☐ Duo-Pactor ☐ Duo-Flo Bituminous Distributor
☐ Duo-Scraper ☐ Name of my S-G Dealer

Name_____

Organization_____ Position_____

Street and No._____

Post Office_____ State_____

FANTASY YESTERDAY...

ROUTINE TODAY...

when asphalt's there to help!

The construction of roads and freeways that only yesterday were considered fantastic is now going full speed ahead. Thanks to asphalt this construction is easier, better and less costly. Comparative cost figures make it plain that in initial cost and in maintenance, asphalt saves millions on heavy-duty roads. And if you have driven on asphalt—and on anything else—that's all the argument you need in favor of asphalt for safer, more comfortable riding.

Sohio long ago established itself as one of the largest producers and sellers of asphalt in the nation. To maintain this reputation, two factors have been responsible—*consistent* top quality and Sohio's famous "round-the-clock" service that loads and delivers asphalt supply where and when it is needed *day or night*. To take advantage of this service, make Sohio *your* source of asphalt supply. Call or wire, Sohio, Asphalt Division, Midland Building, Cleveland 15, Ohio.

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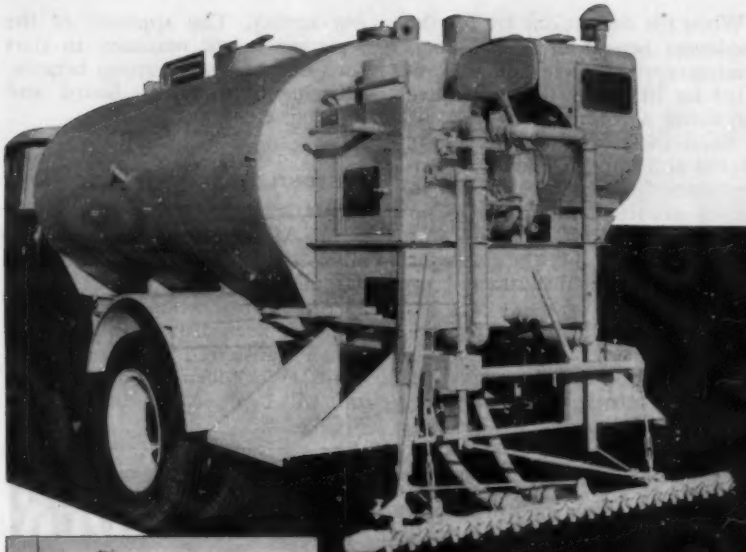


Utility spray tank for hand patching and bar spraying

With the complete line of Littleford black top equipment, there's never any compromise with your requirements. Nor do you ever have to buy a unit larger than you need.

The 101 utility spray tank is designed for contractors and municipalities doing a lot of patching including some bar spraying. It's ready for all your jobs whenever you want it, and without skilled operators. Truck mounted or trailer models, sizes 400 to 1000 gal. capacity. Write for bulletin 5.

LITTLEFORD the right equipment for every job

tar and asphalt kettle for hand patching only

Where you're doing all hand patching and no bar spraying, the 84HD kettle is your best buy. Two patented features—the double heat circulation system and the screened reservoir—make the fastest, safest maintenance kettle on the market. Made in 3 models: standard, with hand spray attachment (below) and with motor spray attachment (left). Write for bulletin 1. Littleford Bros., Inc., dept. LB 223, 454 E. Pearl St., Cincinnati 2, Ohio.

world's most complete line of completely engineered black top equipment

. . . for more details circle 299, page 16

Broom Drag Specified by Wisconsin Department

New standard specifications for the Wisconsin Highway Commission which are to become effective this summer will include the requirement of a broom drag in the finishing of hot-mix asphaltic concrete pavements.

The engineer of materials of the Commission, J. R. Schultz, has advised Roads and Streets that the broom has been adopted with three objectives in mind:

1. It will provide, the Wisconsin engineers believe, a more tightly closed surface by filling in the "pulls" or fissures and surface voids usually left by the paver screed when placing mixtures composed of a high proportion of crushed rock aggregate.
2. The broom should provide a more uniform surface appearance.
3. It will help secure a more skid-resistant surface by obtaining a "sandpaper" finish through the deposit of "fines" on the surface by the broom.

According to Schultz, the latter factor has not been proved by tests, but is on a conjecture basis, indicated by investigations by others. The data is believed to show that a sand-textured surface is more skid-resistant than a stony surface.

The broom drag device mounted on the bituminous paver was required in paving the Kansas Turnpike during the 1956 season.

Deductions Allowed Under Present Labor Laws

The matter of "wage kickbacks" covered by the Labor law will be receiving a larger share of attention on highway work in the future. Here are some of the deductions which are legal under the statutes existing at present:

(a) Deductions by court order, except those in favor of the contractor or subcontractor.

(b) Any deduction required by state, local or federal law.

(c) Deduction for prepaid wages —no discount or interest is allowed on these.

As noted in a bulletin from Virginia Road Builders Association to its members, there are certain other deductions generally authorized by the Secretary of Labor under the following conditions:

If they are not prohibited by law.

If the employee consents in writing in advance of the pay period and if they are not in a condition for obtaining or continuing work.

When the deductions are for the employees' benefit, or that of a bargaining representative, and are provided for in a bona fide collective bargaining agreement.

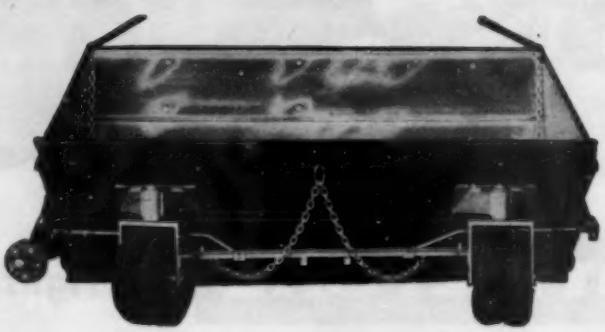
When the deductions serve the interest and convenience of the employee and have been customary in similar situation, and involve no benefit either direct or indirect or any return of funds to the employer —as contractor, subcontractor or affiliate.

For the purpose of making deductions, the contractor must make application to the Secretary of Labor with a copy to the contracting agency. The approval of the secretary is not necessary to start such deductions for group benefits, retirement insurance, board and lodging, etc.

Missouri Abandons Road Construction Force

The Missouri state highway commission has disclosed that the state has officially abandoned its state-operated construction force. Equipment has been disposed of and personnel transferred to other departments. Work formerly done by the unit will be done by contract.

OVERMAN STONE AND BITUMINOUS SPREADER



IMPROVED . . . This all-purpose, low cost spreader is now equipped with pneumatic tires, providing easier steering and moveability, and eliminating vibration and road shocks when towing.

If this spreader is not part of your paving equipment, investigate at once. It's the most efficient, easiest operating paver available, and its low price will surprise you.

WRITE FOR BULLETIN TODAY

I. J. Overman Mfg. Co.
BOX 896 MARION, IND.

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SWENSON SPREADERS Speed Sealcoating!

Spreads Salt or Chloride for DUST CONTROL or SOIL STABILIZATION

write for complete information
SWENSON SPREADER & MFG. CO.
Lindenwood, Illinois

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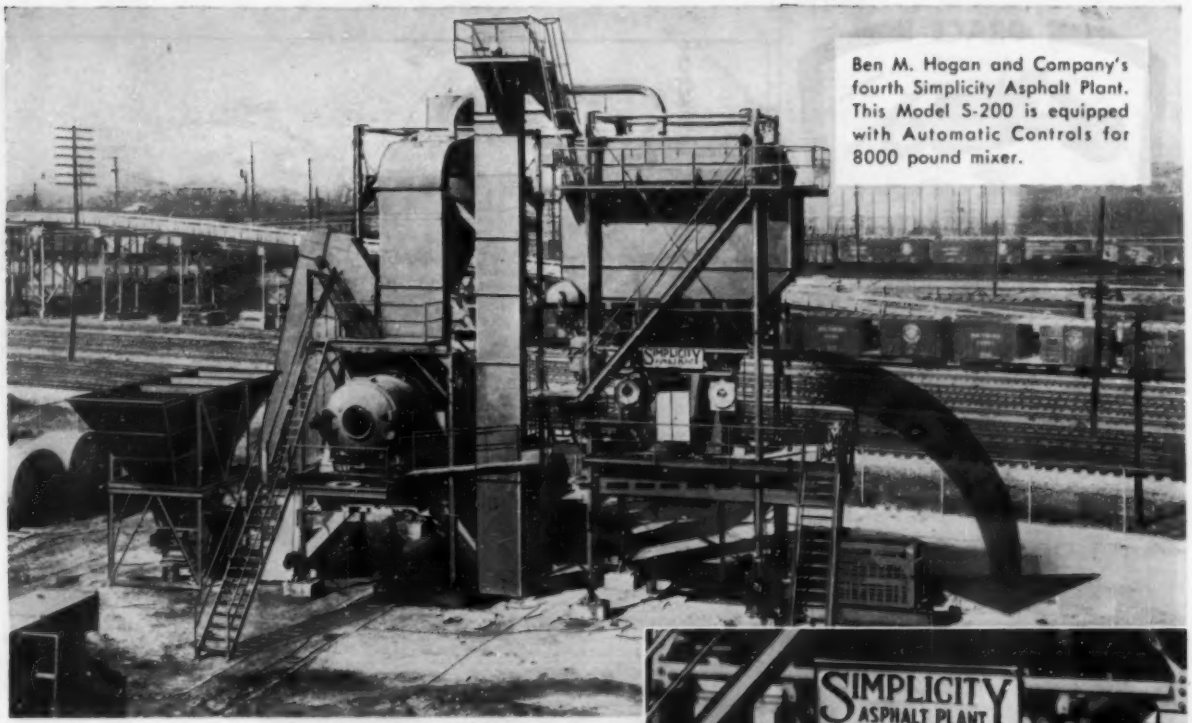
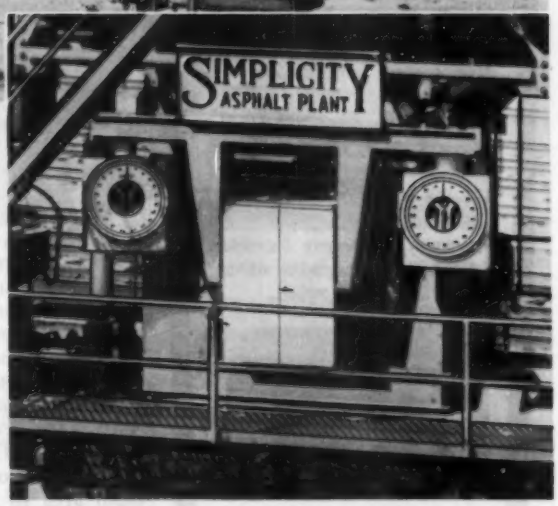


Ben M. Hogan and Company's fourth Simplicity Asphalt Plant. This Model S-200 is equipped with Automatic Controls for 8000 pound mixer.

Simple as ABC

AUTOMATIC
BATCH
CONTROL



Push one button—up to six uniform batches automatically, as quick as a wink! May also be operated manually in the conventional manner.

Simplicity Automatic Equipment is available *ONLY* on Simplicity Asphalt Plants, new or old.

THE SIMPLICITY SYSTEM

FROM BUILDER TO BUYER
BETWEEN MEN WHO KNOW

THERE'S A SIMPLICITY PLANT NEAR YOU

On request, we'll be glad to send you the name and location of a nearby installation.

DEPENDABLE

THE SIMPLICITY SYSTEM COMPANY

RIVERSIDE DRIVE PHONE MAdison 2-2144 CHATTANOOGA 6, TENNESSEE

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GRACE

3 sweeper models, axle, engine or tractor powered.

Sheepsfoot Rollers 250 to 600 psi.

GRACE Asphalt and Compaction Equipment

Rapidspray Maintenance Distributors. Also heaters for production melting of barreled asphalt.

Rapid Fire circulating heaters heat and unload large tanks of asphalt.

Chip spreaders 8' to 12' width. Also asphaltic concrete spreaders.

Pneumatic rollers 7 to 50 tons.

W. E. GRACE MFG. CO.

6007 S. Lamar Street
Dallas, Texas

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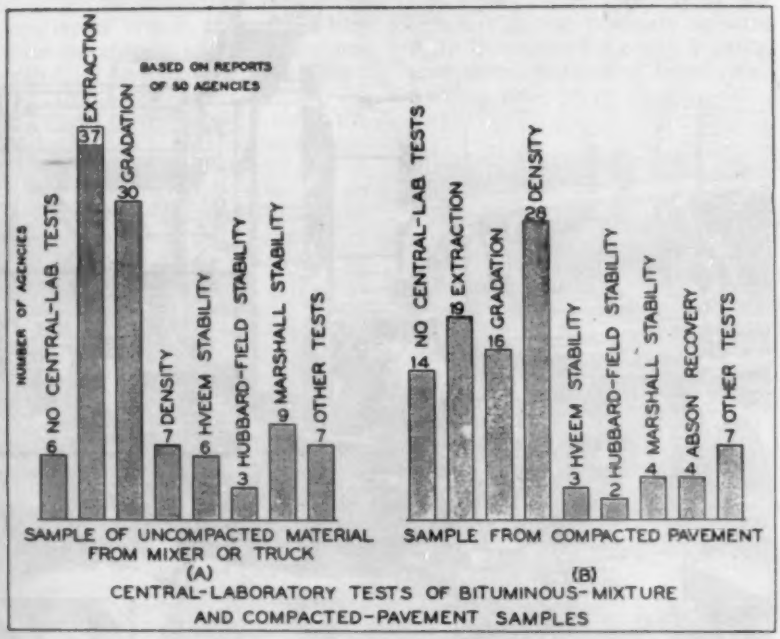


Figure 10.

BITUMINOUS PRACTICES

(Continued from page 184)

These are only a few of the items that were covered by the questionnaires. Information on items extending through the entire field of bituminous concrete is contained in the full report. Perhaps the one most significant fact brought out by the survey is the basic similarity of practice throughout the country. This is true even though it is quite apparent that the design standards and rigidity of controls are varied from area to area to make use of available materials and to meet the demands of traffic and climate.

Trade Old Equipment—or Best to Sell It?

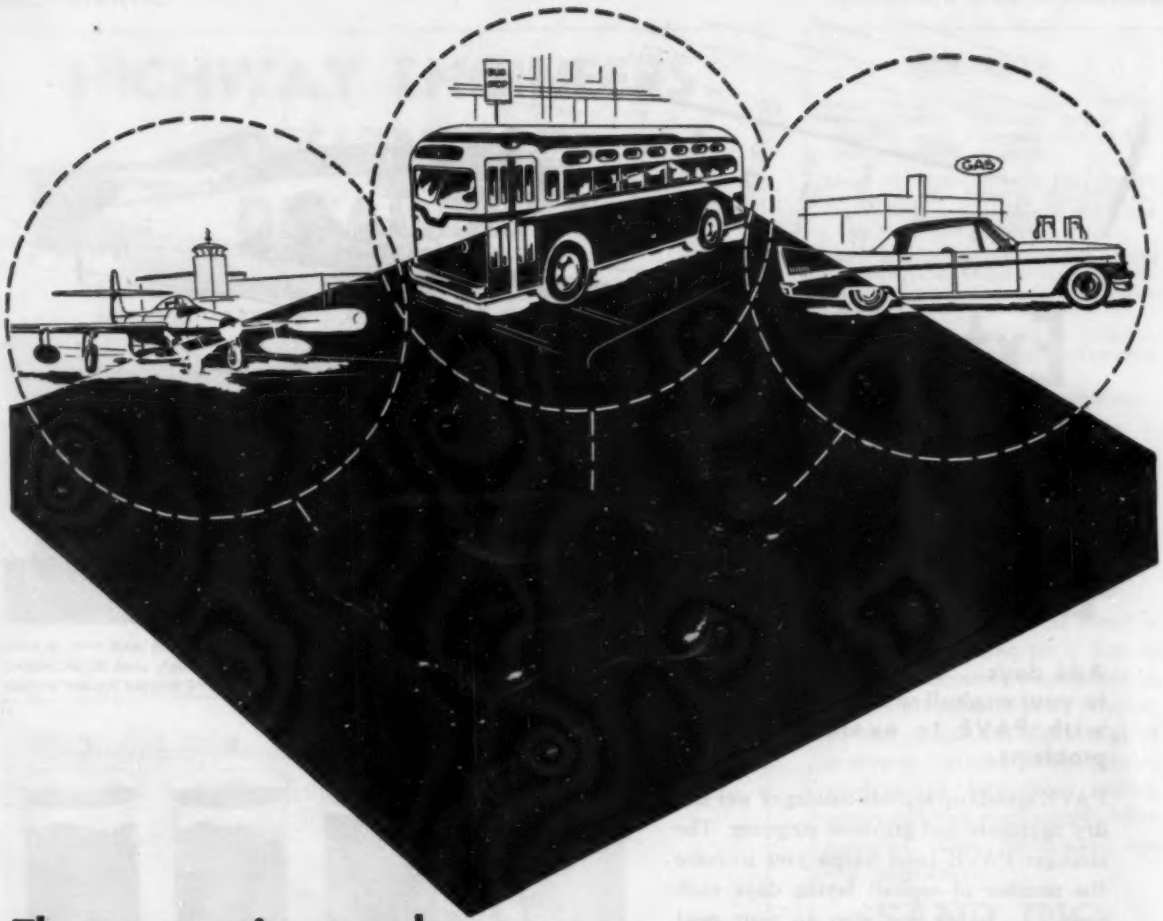
In times gone by, the construction firm was usually satisfied to trade in its old equipment on a new unit, recognizing this as the easiest manner of disposing of it. Under the present day tax structure, notes one of the state contractor associations, it is often advisable to sell the old machine instead. Following are some instances of this kind: (a) when book value is in excess of trade-in value; (b) when trade-in and cash sales values are approximately equal. In case (a) the difference between book value and the sale price is deductible as a loss. When the equipment is traded the loss is carried as a part of the new asset and recovered through depreciation. In case (b) the capital account is cleared before another item is entered and this can be of some advantage in dealing with the I.R.S. "salvage valuation reserve" in considering equipment.

Air-Cooled Tractors and Engines Coming to U. S.

Air-cooled tractors and engines from Germany's famous Porsche-Diesel will soon be made available to American industry and agriculture.

With U. S. headquarters in Bridgeport, Conn., Porsche-Diesel of America, Inc., will import the 1 to 4-cyl. products of one of Europe's most modern motor works at Friederichshafen, on the Lake of Constance. To be introduced in the New England and New York areas, the Porsche-Diesel units will be shipped from Germany at an initial rate of 100 a month.

Like the little Volkswagen automobile, the Porsche-Diesel offers air-cooling. The tractors, which will soon be making their appearance in this country, are said to be remarkably versatile and have been proving themselves not only in farming but in such varied industries as lumber, construction, milling, hauling of many kinds, and even in driving through rather deep water, according to the company.



There are times when
ONLY THE BEST* WILL DO

Where fuel drippage is a problem, your best answer is a hot-lay tar concrete using *Tarmac*®. Coal tar, the principal ingredient of *Tarmac*, is resistant to the softening and stripping action which gasoline, diesel, and jet fuels have on other bituminous surfacing materials.

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******When planning your roads, remember the extra values* **TARMAC**® *gives you over other bitumens:*

1. Faster coating of aggregate
2. Superior penetration
3. Better binding properties
4. Superior moisture resistance
5. Resistance to stripping
6. Self-healing properties

KOPPERS

TARMAC®
ROAD MATERIALS

. . . for more details circle 295, page 16

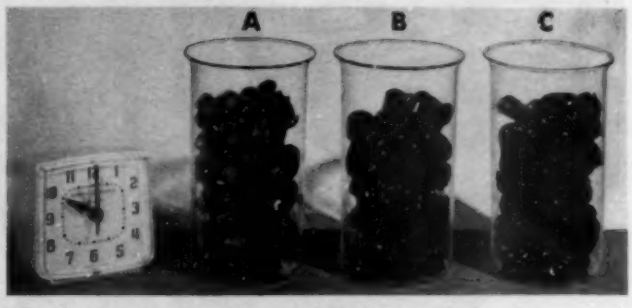
Extra Days to Lay Asphalt!

Add days . . . weeks . . . even months to your asphalt road building season with PAVE to overcome water problems.

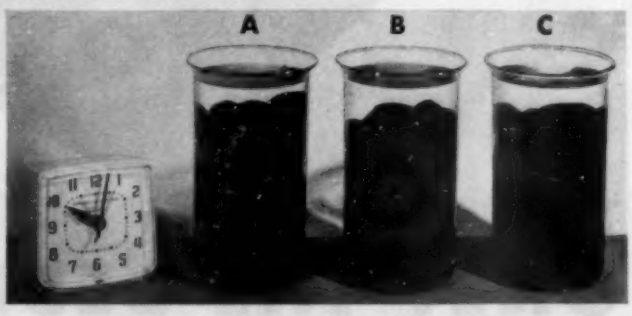
PAVE speeds up asphalt coating of wet and dry aggregate and prevents stripping. The stronger PAVE bond **helps you** increase the number of asphalt laying days each year . . . **helps you** step up your road building program without increasing crews and equipment . . . **helps you** meet your scheduled deadlines.

Demonstration at right shows how PAVE treated asphalt produces a stronger asphalt-aggregate bond to prevent stripping and to withstand prolonged water attack.

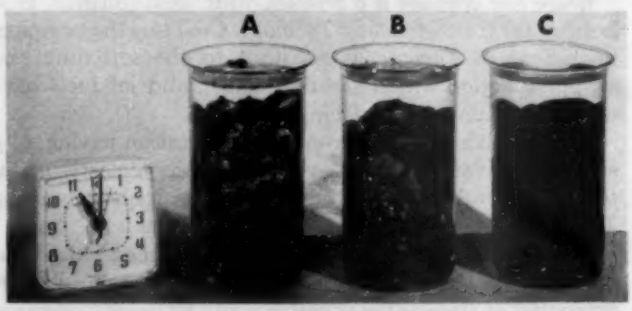
PAVE lets road builders start earlier in the spring to patch, surface treat, and lay hot mix courses . . . continue operations past the end of the asphalt laying season . . . and have fewer lost days and slowdowns because of wet conditions during the longer season.



1. Freshly prepared mixes made with MC-2 asphalt cutback and river gravel. (A) Untreated asphalt on damp aggregate does not completely coat. (B) Untreated asphalt on dry aggregate gives 100% coating. (C) PAVE treated asphalt on wet aggregate gives 100% coating.



2. Mixes are immediately covered with water. (A) Strips at first water contact. (B) Starts to strip leaving bare surfaces exposed to additional water attack. (C) Retains complete coating with the stronger PAVE bond.



3. After one hour exposure to water. (A) Strips completely. (B) Strips . . . with not enough asphalt remaining to hold aggregate in place. (C) Totally coated. PAVE remains active in mix to prevent stripping and to give added road life.

PAVE HEAT-STABLE

For more information on how PAVE can help you . . . write our PAVE Technical Service Dept.

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CATERPILLAR D-4 #217397, Bucket Loader, Hyster Winch, Bulldozer. Army surplus, 900 hours F.O.B. ..... $ 4,000.00
CATERPILLAR D-7 #4T3719, LeTourneau Angle Dozer, Hyster Winch 1300 hours, F.O.B. 8,000.00
CATERPILLAR D-8 #1H6894, LeTourneau Angle Dozer, Army surplus, 1700 hours.. 6,500.00
CATERPILLAR D-8 #8R8796, LeTourneau DDPCU. Army surplus, 1500 hours..... 6,500.00

CRAWLER CRANES - ARMY SURPLUS

BAY CITY 20 #5179 with Hercules JXC gasoline motor, 30' 2 piece boom, 3/8 yard capacity, F.O.B. ..... $ 5,500.00
BAY CITY 37 #3097 with IHC UD-14 diesel motor, 35' boom and fairleads, 3/4 yard capacity, F.O.B. 9,500.00
B-E 10B #2034 with Buda 6 cylinder gasoline motor, backhoe and shovel front, 3/8 yard capacity, F.O.B. 6,500.00
B-E 15B #27460 with IHC UD-9 diesel motor, 30' boom and shovel front, F.O.B. 7,500.00
OSGOOD 200 #4334, Chrysler Industrial 8 cylinder, 30' boom, 1/2 yard, F.O.B. 4,000.00
OSGOOD 200 #4015, Chrysler Industrial 8 cylinder, 30' boom, 1/2 yard, F.O.B. 4,000.00
OSGOOD 200 #4824, Chrysler Industrial 8 cylinder, 30' boom, 1/2 yard, F.O.B. 4,000.00
OSGOOD 200 #4226, Buda 6 cylinder gas, 30' boom, 1/2 yard, F.O.B. 4,000.00
OSGOOD 50 #5907, Buda 6 cylinder gas, backhoe 3/8 yard, F.O.B. 5,000.00
OSGOOD 705 #3549, 1 Yard, Buda Diesel, UNUSED, F.O.B. 15,500.00
OSGOOD 800 #3411, 1 1/2 Yard, Cat D-1300, 50' boom, Generator and Panelboard, F.O.B. 19,500.00
MARION 342 #8242, Caterpillar 4600 diesel, 35' boom, 1 yard, F.O.B. 13,500.00
MANITOWOC 20008 #2278, Hercules diesel, crane or shovel, 1 1/4 yard, F.O.B. 17,000.00
LINK-BELT LS-75 #11873, Chrysler Industrial 8 cylinder, 35' boom, 3/4 yard, F.O.B. 10,000.00
LINK-BELT LS-50 #5197, Buda gasoline, 6 cylinder, 30' boom, F.O.B. 5,500.00
LINK-BELT K-375 #1991, 1 3/4 yard, Cat D-13000, Used Only 60 Hours, Like New. F.O.B. 25,500.00
LIMA 101 #127 Crawler, 1 1/4 yard, with 60' boom, F.O.B. 5,000.00
KOEHRING 304 #3938, Chrysler 8, 35' boom 9,500.00
LINKBELT LS-75, Cat 4000, Backhoe 10,500.00

TRUCK CRANES - ARMY SURPLUS

LORAIN MC-2 #11033 mounted on factory 6 x 4 carrier, 32' boom $10,000.00
LORAIN MC-3 #13787 mounted on factory 6 x 4 carrier, basic boom, Waukesha engines in crane and carrier, F.O.B. 13,500.00
P&H 150TC #8609 mounted on factory 6 x 4 carrier, 45' basic boom and Chrysler Industrial 8 cylinder motors in crane and carrier, F.O.B. 10,500.00
LORAIN MC-3 #13949 on factory 6 x 4 carrier, basic boom and White motors.... 13,500.00
LORAIN MC-4 #17535 on factory 6 x 4 carrier, basic and Waukesha motors..... 16,500.00

MISCELLANEOUS

BARBER-GREENE, 554 Coal Loader #48-77, Army surplus, unused, F.O.B. ..... $ 3,000.00
GALAN 25-Ton, Tandem, Dropdeck Trailer, New 1955, F.O.B. 2,500.00
INGERSOLL-RAND 210 Air Compressor, Waukesha gas, 4 pneumatic tires, F.O.B. 1,500.00
JAEGER 40' Pile Drivers, Dixie double drum hoist. Army unused, F.O.B. 1,500.00
LeROI 600 Air Compressor, Murphy diesel. Like new. Army surplus 5,500.00
LeTOURNEAU K-30, Rooter, F.O.B. 800.00
MISSISSIPPI Bottom Dump Wagons, Army surplus, unused, F.O.B. 1,000.00
TAMPCO Compactors, Pneumatic Tires, F.O.B. 1,200.00
CATERPILLAR Pull Grader. New, Model 66, unused, F.O.B. 1,000.00
LeTOURNEAU C Tournarocker, 14 yard rear dump, 21:00 x 25 (4) tires. UNUSED... 9,500.00
IOWA Model 2 A Secondary portable crusher mounted on 12:00 x 20 rubber. Unused.. 9,000.00
EUCLID Bottom Dump 18:00 x 24 tires. Unused 3,950.00

ATTACHMENTS - ARMY SURPLUS

BAY CITY 20 Hoe Dipper, Sticks. Unused.. $ 300.00
BAY CITY 20 Shovel Front. Unused..... 500.00
BROWNING T-20 Section 15'. Unused..... 125.00
BROWNING T-15-C Craneboom Tip 13'. Unused 450.00
BUCYRUS-ERIE 22B Shovel Front..... 1,250.00
BUCYRUS-ERIE 37B Shovel Front..... 2,500.00
BUCYRUS-ERIE 37B Craneboom 45'. Unused 1,000.00
BYERS 83 Backhoe. Unused..... 1,200.00
LIMA 34 Shovel Front. Unused..... 1,500.00
LIMA 1201 Jibs and Harness. Each, unused 750.00
LIMA 604 Point Sheaves and Harness. Unused 200.00
LORAIN 41 Backhoe..... 950.00
MICHIGAN TK Craneboom 30'..... 450.00
MICHIGAN TM-16 Craneboom 30'..... 650.00
NORTHWEST 25 Shovel Front. Unused..... 1,750.00
NORTHWEST 8 Craneboom 50'. Unused... 1,000.00
P&H 255 Craneboom 30'..... 900.00
SCHIELD-BANTAM Jib, 8'. Unused..... 50.00
SCHIELD-BANTAM Section, 5'. Unused.... 50.00
LIMA 1001 Dragline Boom. Unused..... 1,750.00
B-E 22B Cranebooms 35'. Unused..... 950.00
KOEHRING 304 Craneboom. 35'. Unused.. 950.00
LIMA 1201 section 10'..... 300.00
MARION 342 craneboom 35'. Unused..... 1,000.00
MANITOWOC 2000 B craneboom 45'..... 1,200.00
OSGOOD 200 shovelfront. 90%..... 900.00

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Model 95—Northwest Dragline—Murphy Diesel Engine, 75 foot Boom

EXCELLENT CONDITION

Motor Crane—20 Ton GarWood Model 75 BT.

FULLY EQUIPPED—PRACTICALLY NEW

1—New GarWood Dragline Model 75-A

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1 Used 2 Yard Lorain Shovel; Waukesha Diesel; Serial #17192; 15 ft. Crawlers; 34 in. thread; New Drive Chains; New Crow Chains; New Center Pin Bushings; New Swing Pin Bushing; Rebuilt Sprockets, Idlers, Rollers; All New Bushings and Shafts; Factory Rebuilt Injection Pump; New Air System; New Clutch; Body Clean, No Dents, Photo sent on request. No Trades; $11,000.00 spent in repairs and parts. Total Price, $26,500.00 F.O.B. East Hartford, Connecticut.

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PORTABLE PLANTS

Cedar Rapids Model AA Primary - 22x25 RB Jaw, 24" Feeder, 30" Delivery Conveyor, GMC 4031C Power. Like New..... $23,500
Cedar Rapids Pitmaster - 16x16 RB Jaw, 10x16 RB Roll, 30"x10' 2-deck Screen, GMC 3031C Power. Like New $20,000
Pioneer - 10x24 RB Jaw, 18x24 RB Roll, 3'x10' 3-deck Screen, GMC 671 Power. Good. $12,500. Universal Washing Plant - Includes 48"x30' scrubber screen, 3 bins, total capacity 70 cu. yd., Eagle washers, 24" conveyor, 6" pump, motors, etc. Very good $21,000

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604 Koehring, D13000 Cat. Engine, 60' boom, 2 cu. yd. Page bucket. Very good.. $20,000
Northwest Model 7, Wisconsin engine, 50' boom, 2 cu. yd. Page bucket. Good.. $7,500

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Cedar Rapids Hammermill 30x33 w/Murphy Diesel ME66. Like new..... $6,000
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Cummings NHIS Engine, 275 H.P. with Clutch, V-belt, Pulley. Excel. Cond. ..... $2,000.
Bucyrus-Erie 29T Drill, Caterpillar Engine, new 1953. Very good $16,500
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Worthington 210 CFM Compressor $1,700
Buda Model 6DH 691 with clutch and power take-off. Very good..... $2,000
Bucyrus-Erie 29-T Blast Hole Drill with Cat. D-311 engine. Mfg. in 1953. Excel. Cond. Price $16,500

CONTRACTORS EQUIPMENT
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Peoria, Illinois

FOR SALE

2—Mod. D8 Cat. Tractors w/#25 P.C.U. & 8S Dozers—13A Series, each	$17,500.00
1—Mod. 28 Caterpillar Pull Type Ripper	2,500.00
1—Mod. D4 Cat. Tractor w/IT4 Trackson Loader	2,500.00
1—Mod. 88B Bucyrus-Erie Shovel Only (4 cu. yd.) w/VT 12 Cummins Engine and torque converter, New 1951	70,000.00
1—Mod. 54B Bucyrus-Erie Shovel Only (2½ yd.) w/DC1879 Buda Diesel Engine, New 1949	35,000.00
1—100 ton Southwest Mod. CU Pneumatic Tired Roller w/5 2400 x 32, 32 ply tires	8,000.00
1—16 cu. yd. Model 801 SP Kenworth End Dump w/NHRBS Cummins	22,500.00
1—Mod. 29T Bucyrus-Erie Blast Hole Drill w/30 HP Electric motor	4,000.00
1—Mod. 12 Bucyrus-Erie Bit Sharpening or dressing unit	3,500.00
1—4 cu. yd. Koehring Tilt Concrete Mixer w/75 HP Elec. motor	4,500.00
4—Mod. 200 Rex Double Pump cretes, 2 gas, 2 electric, ea.	7,500.00
5—Mod. HFP171 Hydro Silica Pumps, electric, ea.	1,250.00

For a complete list of items available for sale write for our current bulletin

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Phone - PLaza 6-0300 Ext. 125

For Sale

1—53x60 heavy-duty, double impellor, Iowa Mfg. impact breaker, complete with 50"x14'x6" heavy-duty cast manganese feeder. Used 7 months.

2—42" conveyors. One conveyor 155' long; the other 160' long. Used 7 months.

1—McCully gyratory crusher #11.

1—Marion electric shovel, Model 6RS.

Numerous other units including ½-yard to 2½ yard shovels; Murphy & GMC power units & generator sets. Screens, jaw crushers, rolls, bucket elevators, etc. Some units mounted on rubber-tired chassis.

Write for complete list and prices to:

Concrete Materials & Construction Co.

P. O. Box #790
Cedar Rapids, Iowa

FOR SALE

1—Link Belt Speeder Model LS85 Shovel & Backhoe Serial #7A1226, Year 1949, w/Cat. 318 Engine ..$10,500.00

1—Bros. 50 ton rubber tired compactor year 1954, Serial #GPR3060, Model 450. Used very little. ....$ 7,500.00

1—Chester 60" double drum tamping roller, w/8" wedge feet. Used approximately 2 months. Year 1954 .....$ 3,000.00

3—Caterpillar DW 10 w/Athey Side Dumps, Serial #1V1498, 1V1455, 1V1497, Year 1950, Cat. 318 Engines .....ea. $ 9,000.00

1—Link Belt Speeder, Model K370 w/-shovel front 1¾ c.yd. bucket and 70' crane boom, powered by D13000 Cat. Engine, Serial #2533, Year 1946. .....$20,000.00

All reasonable offers will be considered.

CAMPANELLA & CARDI CONSTRUCTION CO.

780 Jefferson Blvd.
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Ph. Regent 7-1300

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94	MP-116	34 to 35 ft.	Wisconsin
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75	MP-116	60 ft.	Chicago
110	MP-115	35 to 60 ft.	Kansas City
130	MP-116	35 to 45 ft.	Alabama
36	MP-115	60 ft.	Nebraska
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Three Model B Tournapulls, approximately 1700 hours each. All change-overs installed.

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P&H 855B 2 yd. Shovel
GM 6-71 Std. Crawlers.

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D8 & D7 Rock Guards—Also Pads

1000 New Army Watertight Tool Boxes or Food Boxes

640 New One Gallon Neoprene Tanks

D7 Caterpillar with Bulldozer

LeTourneau Tournapull Dump Trailer 11½ yds.

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JAEGER MODEL SPS-1

Aggregate Spreader, 6 cylinder Continental Engine. Rubber mounted, chain drive. Excellent running condition. A real labor saver and a good buy @.....$3,500.00

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Powered by Hercules gas engine, equipped with all weather cab, wiper and intake heater fan. Just installed brand new hydraulic pump. Very clean and in excellent running condition $3,500.00

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Located in Cincinnati, Ohio
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In Cincinnati call Jim Roberts or Clyde Brown, Sun Construction Company, Elmhurst 1-3252—Mailing Address—P. O. Box 2736.

In Knoxville call Roy B. Madgett or Frank Diggs, 2100 Ailor Ave.

TRUCK CRANE
P & H Model 150-10 Ton, Heavy duty. Equipped with remote control, D.C. Generator for Magnet and Lighting, Clam Shell attachment, 60 ft. Boom, New Tires, Excellent condition. Price--$9,000.00

CRAWLER CRANE
Koehring—¾ Yard Backhoe, Model 304 equipped with Shovel-Dipper and Stick, 50 ft. Crane Boom. Excellent condition. Price----------$11,500.00

AIR COMPRESSOR
Jaeger, Model 250, C.F.M., Mounted on 4-wheel carrier, new tires. Powered by International Diesel Engine. Excellent condition. Price------$4,200.00

AIR COMPRESSOR
Jaeger, Model 75, C.F.M.—Mounted on two-wheel carrier, New Tires, powered by Continental Gas Engine. Price ----------$1,500.00

HOIST
Buck Model V2M, with 35 ft. Tower, 2000 lbs. capacity, Mounted on 2-wheel carrier with new tires. Price ----------$2,000.00

CONCRETE MIXERS—5 ea.
Jaeger, Model 11S Bag, mounted on two-carrier, new tires. Powered by Wisconsin Gas Engine. Price ----------$1,100.00 ea.

WELL TOWER
Archer, 117 ft. Heavy Duty, two-wheelbarrow platform. Price ----------$2,500.00

Write for listing of over 100 other items we are offering for sale, at bargain prices.

USED EQUIPMENT

2—LeTourneau - Westinghouse Model D Tournapulls. Excellent condition throughout.
1—LeTourneau - Westinghouse Model C Tournapull, 24x25 (24 Ply) Tires; new in 1956. Very low hours.
1—LeTourneau - Westinghouse Model C Tournapull, 24x25 (24 Ply) Tires; new late 1955. Very low hours.
1—Euclid Model S-7 Motor Scraper. Like new, total operating hours 920. Has been factory modified.
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1—International TD-19 Tractor with Hydraulic controlled Garwood Scraper.
1—Woolridge Scraper, 12 yard capacity.
1—Allis-Chalmers Model HD-19 Tractor, with Double Drum PCU, Push Block, Engine completely overhauled, Rollers, Rails, etc. Good.
1—International Model ID-6 Tractor, Industrial Type, Rubber Tires.
1—Oliver Model 900 Tractor with 4½ yard Hydraulic LaPlante Choate Scraper.
1—Tilt Trailer, adapted to pull with dump truck or similar equipment, excellent for hauling anything up to HD-10, D-7, etc.
1—Jaeger 27' Finishing Machine with transportation rig.
1—1950 Chevrolet Truck with Jaeger Mixer.
1—Rex Model 160S Pumpcrete Single with Remixer with Continental Gasoline Engine Model F 186. 800 lineal feet of 6" O.D. Pipe.

MILLER MACHINERY INC.
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Ph. CHapel 1-2511

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Adams Model 610 Motor Grader—New Engine, 14:00 x 24 Dual Tandem Good tires. Less than ½ price $7,995.00

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HD25 Allis Chalmers Yard ½ Loader. Excellent condition. 30 days guar. 1200 hours..$9,000.00

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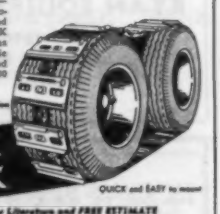

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1 Ea. Model ⅝25 Northwest Crane & Dragline with 40' boom, powered with 471 GMC diesel. This machine completely rebuilt. Priced to sell.

1 Ea. L40 Lorain combination Crane, Shovel, Dragline, powered with Minneapolis Moline LP Gas Engine. This machine completely rebuilt. Priced to sell.

1 Ea. TD-9 International Crawler Tractor with hydraulic Bucyrus-Erie angle dozer. Condition good. Priced to sell.

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Manitowoc 3000-B's, 3500's erect cranes — shovels, long booms, wide long cats diesel. Also 2000-B's.

Northwest 6's, 80-D's, and 95 cranes — drags — shovels, diesels, wide long cats — long booms. Ind. BH's.

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Marion, Koehring, Link Belt & Lorain models cranes — drags — shovels, wide long cats — diesels. Also backhoe equipped machines, all types.

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Excellent LORAIN L-41, Serial 19345, Cat. D-318 power, 30" shoes, Calmshell-Dragline, 50 ft. boom, pendant suspension. Formerly owned by building contractor. Crane and motor completely overhauled with $4000 parts installed in 1956. This is a good one. Price $12,000.00 F.O.B. cars, Kansas City.

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Allis Chalmers Model TS200 S/N T200-2153, traction tread tires, bucket seat & cab.

Cleveland Model Trencher S/N 3446, with electric starter, air cleaner, oil filter, deep oil pan, 10" smooth crawler pads.

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Bakers Model SFD 96 Sheepsfoot roller (double) S/N 237.

1953 G.M.C. 6 yd. dump truck, with 2 speed rear axle.

1949 Chev. COE, Engine #GBA 39525, with lowboy trailer.

3" Water Pump (new in 1956).

D-8 Dozer, S/N 2U19042 SP with 8A Dozer S/N 7A4584 #25DDPUC S/N 9D23144.

1950 La Plante Choate Wagon, S/N C-314-488, 12-15-C.Y. Capacity.

The above equipment is in excellent condition, and is located at Pontiac, Michigan.

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Jaeger Fleetfoot 6-Ton Yard Crane $3,250.00
½ yd. Link-Belt Speeder Mdl. LS-40 Crane, 25' boom 3,450.00
½ yd. Shovel Attachment - Link-Belt LS-50 ..... 900.00
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Model 30 Ferguson Tractor with Model S Everett Trencher .. 2,100.00
Model HA Hough Loader 895.00
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Model 140 Buckeye Trencher .. 1,000.00
Model 16 International Tractor with Hough 1 yd. Loader ... 2,250.00
Model 64 Baker-Lull 1½ yard Front End Loader - Excellent - Best Offer.
Model 3HM-C Jaeger 3 yard Closed End Truck Mixers .. 1,395.00
Jaeger Model 1E1 Single Drum Erectors Hoist - 78 H.P. - Best Offer.

Flack Equipment Co.
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Dayton 1, Ohio

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2—Allis-Chalmers HD-15 Dozers, 1 hydraulic and 1 cable. Both in top condition.

1—International TD-9 with 1½ Hough hydraulic loaders. Good condition.

1—Cat. 212 Grader, tandem drive. Excellent condition.

1—Adams 660 Grader, Cummins engine. Top shape.

1—¾-yard Buckeye Combination Shovel and Drag. Good condition.

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St. Louis, Missouri
Ph. Prospect 1-0292

FOR SALE

1954 ½ cubic yard Link Belt, Model LS-50, with 40' boom, backhoe and shovel, front drag and clam buckets, serial #SD-551
One (1) 1947 160 Buckeye Trencher
One (1) 221 Parson Serial #1709 Trencher
One (1) Rapid paving breaker, Serial #188.

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CATERPILLAR 12 Grader W/Scarifier .. $2,750.00
Caterpillar D6 W/Cat. 25 P.C.U. and Bulldozer, 9U Series, Good Condition 5,750.00
EUCLID 49FD End Pump GM Diesel Power 8,750.00
HOUGH HMG 4 Wheel Drive Hydraulic Loader 1½ Yard 14.00x24 Tires..... 3,750.00
LETOURNEAU LS Scraper 8-11 Yards.. 2,650.00
LETOURNEAU M Scraper 6-8 Yards... 1,475.00
BUCYRUS-ERIE 88B Scrapers 14.00x20 Single Tires 6-8 Yds. Choice of 2, ea. 2,500.00
BUFFALO SPRINGFIELD KT16 Tandem Roller Hydraulic Steering Excellent Condition 1,150.00
GALION 8-12 Ton Tandem Roller Powered by International Diesel, Good Condition 3,350.00
NORTHWEST 25 Dragline, Crane Combination 40 Foot Boom, 11 Foot Crawlers, 24 Inch Tracks, Powered by Ford 337 Industrial Power Unit 3,875.00
TOURNAPULL D ROADSTER, 1700 Hours 8,500.00
50—13.00x24 Grader Tires, ARMSTRONG 8-PLY FIRST QUALITY, GUARANTEED, Each 115.00

AL FISHEL EQUIPMENT SALES CO.
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St. Louis 13, Mo.

FOR SALE

1 - Willard Batching Plant Model GL - S/N 188 with Weigh Batcher and Ford Industrial 6-cyl. and Willard 24' Batch Conveyor, S/N 171 with 5 hp Electric Motor.

1 - Badger Model 303-3 Ditcher, S/N 374 Crawler mounted, good operating cond.

1 - Buckeye Model 120 Ditcher with Buda Model HD326 Gasoline Engine - 2 sets buckets - good operating condition.

1 - Hyster Model HW-Hystaway Dragline and Crane attachment, S/N 23828 for mounting on Caterpillar D7 or D8 - like new.

1 - Allis-Chalmers Model HD19G, S/N 2046 with 4 cu. yd. Front End Loader with Standard Bucket and Rock Fork. This tractor completely overhauled - new tracks, rollers, sprockets, idlers and engine, torque converter, transmission overhauled, new jack assemblies in loader - This tractor is in perfect condition.

1 - International Model TD14 tractor, S/N 10883-T4 with 180° swinging boom crane model MC2R, S/N 4686.

Pictures available - write, wire or phone.

BORCHERT-INGERSOLL, INC.
2161 University Avenue
St. Paul 14, Minnesota

TRUCKS WANTED

Highest dollar value paid for new and used trucks and all kinds of used equipment. All types of truck equipment bought and sold, including war surplus.

Write, phone or wire:

BILL FISHEL
Vandeventer Auto Sales
717 So. Vandeventer St. Louis 10, Mo.
Ph. FRanklin 1-1750

EUCLID TRUCKS FOR SALE

4—36TD Euclid Rear Dumps, 22 Ton, New 1953-1954

7—2FFD Euclid Rear Dumps, 35 Ton, New 1952

80-D Northwest 2½ Yard Standard Shovel

54-B Bucyrus-Erie 2½ Yard Standard Shovel

TD14A International Drott 2¼ Yard Front End Loader

65 Bay City, 1¼ Yard Standard Shovel

LS85 Link Belt ¾ Yard Standard Shovel

3500 Manitowoc Dragline, 80'—2½ Yard

58BH Joy Diesel Rotary Drill

FRANK FAMALETTE EQUIPMENT CO.
P. O. Box 325 Hazleton, Pa.
Phone GL 5-4708

FOR SALE EUCLID REAR DUMP TRUCKS

Bucyrus-Erie Draglines, 2½ yd. to 8 yd.
Bucyrus-Erie Shovels, ¾ yd. to 8 yd.
Northwest Draglines, ¾ yd. to 2½ yd.
Northwest Shovels, ¾ yd. to 2½ yd.
Manitowoc Draglines, 2½ yd. to 5 yd.
Manitowoc Shovels, 2½ yd. to 5 yd.
Marion Shovels & Drags, 4 yd. to 9 yd.
Lima Shovels & Drags, 1½ yd. to 6 yd.
Osgood Shovels & Drags, 1½ yd. to 2½ yd.
Caterpillar Graders & Dozers.
Hi-Lift Shovels.
P&H Truck Mtd. Crane & Hoe, ⅜ yd.
2400 Lima Shovel front attachment.
4500 Manitowoc Shovel front attachment.
6" and 9" Drills, Diesel and Electric

other equipment available not listed above.

WILLIAM LUBRECHT, III
Construction Equipment
311 W. Diamond Ave. - Hazleton, Pa.
Phone: Gladstone 5-4041 or 5-0253

BRIDGES FOR RENT

BAILEY STEEL TRUSS TYPE VARIABLE SPAN & CAPACITY FULLY PREFABRICATED, PORTABLE CANTILEVER ERECTION

Construction by-passes — Contractors access
Emergency detours — Erection bridges
Falsework trusses — Traffic separation

BAILEY BRIDGE EQUIPMENT CO.
1767 Conjeo Ave., San Luis Obispo, California

'KOLMAN Conveyor-Screen Plant Increased our Production 65% on Sticky Crushing Job'

50-ft. Kolman Model 101 with 36" belt shown separating fines at Hopkins Construction Ltd. job near Edmonton, Alta. Equipped with Model 5S-80 Kolman single-deck screen and feeder-trap combination

KOLMAN
COMPLETELY PORTABLE
CONVEYOR-SCREEN PLANT
CONVEYOR • SCREEN • TRAP • FEEDER

Hopkins Construction Ltd. Thanks a Kolman for Preventing Operating Loss

Hopkins Construction Ltd., Lacombe, Alberta, began a crushing job near Edmonton this spring on which they were required to produce about 40,000 tons of ¾" gravel.

"But when work commenced," said C. D. Marble, "we encountered about a foot beneath the surface exceptionally sticky fines which cut our production to not more than 50%.

"We solved the problem by introducing a Kolman 50'x36" conveyor with vibrating screen. It succeeded in separating the sticky fines from the rock which was passed directly to the crusher. Our production increased about 65% immediately. As a result the job was completed in good time, where otherwise it would have resulted in an operating loss."

The Kolman Model 101 is available in belt widths from 18" to 42" and up to 60-ft. lengths on portable plants. It's capable of carrying either a single, double or triple-deck vibrating screen without additional support, and can be equipped with a dozer trap, casting hopper, feeder-trap, or feeder-hopper. Best of all, the Kolman 101 costs less than comparable heavy-duty conveyors.

Write for Literature and Prices Now

KOLMAN MANUFACTURING CO.
5200 W. 12th St. Sioux Falls, S. Dak.

"Wanted—

Blaw Knox (APSCO) Widener. Advise age, condition, location, and price." Write Box 1184, Roads & Streets, 22 W. Maple St., Chicago 10, Ill.

PUMPCRETE'S FOR SALE

Two 200 Double Pumpcrete with Electric or Gas Motors, Remixer & Auxiliary Equipment. Plenty of 8" Pipe.

Late Model Machine. Completely Reconditioned. Guaranteed A-1 Condition.

C. H. & L. Machinery Co.
Box 1192 - Phone CYpress 2-4132
NASHVILLE, TENNESSEE

FOR SALE OR RENT

1—Koehring, 605 Crane boom, 65', fairleads, counterweight. Good condition.
1—D-7, S/N 3T23592, equipped with 7S blade, and #25 cable control unit.
1—D-8, S/N 2U3928, equipped with #25 cable control unit and stationary push plate.
1—D-8, S/N 8R9935, equipped with stationary push plate.
1—HD-19, S/N 1541, equipped with stationary push plate.
1—Euclid Bottom Dump, Model 25 FDT, S/N 8566, Cummins Engine.
1—Euclid Bottom Dump, Model 25 FDT, S/N 5828, Cummins Engine.
1—Gallon Grader, Model 118, S/N 19983, GMD 4-71 engine.
1—Gallon Grader, Model 118, S/N 20546, GMD 4-71 engine.
1—LeTourneau carryall scraper, Model FPB, S/N, #S-25893.

SMALLEY CONSTRUCTION SUPPLY CORPORATION
436 W. Market St. Celina, Ohio
Telephone 2381

FOR SALE

D-8 CAT TRACTORS

OFFERED:

34 used Model D8s, all equipped with DDPCU and angledozers, cleaned and painted. CHEAP.

15 - 2U Series
1 - 13A Series
17 - 14A Series
1 - 15A Series

WANTED FOR EXPORT

2 Factory new D-8s with DDPCU and Angledozers.

WANTED your Idle inventories of Road Bldg. and Earthmoving Equipment.

WANTED Used or Unused High Pressure Boilers, Diesel Electric Generators and Turbo Electric Generators.

TRACTORS FOR EXPORT, Inc.

2 Maiden Lane N. Y. 38, N. Y.

FOR SALE

1—Allis Chalmers Model HD20 tractor with crankcase guard, radiator guard, front pull hook, heavy duty roller guards, 24-in. tracks, Gar-Wood straight hydraulic dozer, torque converter drive, cab. Serial No. HD20H-5926. GM engine Serial No. 6B6582 Tractor two years old. Condition is better than excellent. This is a machine that is important to see if you are interested in this kind of equipment. Being offered at $14,000.00.

BREBNER MACHINERY CO., INC.

1310 S. Front St., Marquette, Mich. Phone CAnal 6-2537

FOR SALE
SURPLUS MACHINERY

1951 D7 Model 25 with Power Unit & 75 Cat	10,000.00
1—Novo 2 Drum Hoist on Skids	750.00
1—271 G.M.C. Power Unit	1,000.00
2—10 ft Buckeye Chipspreader	ea 500.00
1—6x6 Bros Steel Pull Type Roller	750.00
1—13 Wheel Welco Rubber Tired Pull Type Roller	900.00
1—WC Allis Chalmers Tractor	600.00
1—18x30 Cedar Rapids Roll Crusher Mounted on Skids	2,200.00
1—Eagle Single Screw 18 ft Coarse Material Washer-Dewaterer	1,500.00
1—5000 Watt Kohler Light Plant	500.00

SAND INC.
1313 West 31st South
Wichita 13, Kansas

Euclid Scrapers

Two (2) EUCLID S-7 Self-Propelled Scrapers, 7 yard struck, 9 yards heaped. G.M. Diesel power - Used only 2 months. Like new condition. Immediately available Kansas City at a price approximately $8,500.00 each less than present new price. A real bargain.

The G. W. Van Keppel Co.
2461 Pennway - GRand 1-1540
KANSAS CITY 8, MISSOURI

We do a Nation-Wide business in

STEEL SHEET PILING

AVAILABLE IMMEDIATE SHIPMENT

385 pcs. 60 ft. Both.	DP-2	New York
292 pcs. 60 to 80 ft.	Conv. M-116	Illinois
368 pcs. 60 to 80 ft.	Both. ZP-32	Maryland
188 pcs. 60 ft.	Conv. M-116	Illinois
111 pcs. 45 to 40 ft.	Conv. M-116	Alabama
490 pcs. 42 ft.	Conv. M-116	Louisiana
244 pcs. 35 ft.	Conv. M-116	Wisconsin
290 pcs. 35 to 15 ft.	Both	AP-3—Ohio
190 pcs. 25 ft.	Both. DP-3	Massachusetts

Other lengths and sections new and used at other locations in the United States

McKiernan-Terry and Vulcan Pile Hammers and Extractors
Boilers, Hoists, Derricks, Cranes Compressors, Railroad Equipment, Etc.

Regardless of location of job, write, wire or phone

MISSISSIPPI VALLEY EQUIPMENT CO.
1906 Railway Exchange Bldg.
St. Louis 1, Mo. CHestnut 1-4474

FOR SALE

D-4 Caterpillar with Trackson Loader, with 2 Buckets & Dozer Blade. Very reasonable.

Model HF Hough Payloader in excellent condition, $3,200.00.

1940 IHC TD35 in good condition, $1,100.00.

Brand New Hopto Model 120 Backhoe Mounted on 1½ Ton Truck; ready to go.

New Deere 420 UM Trench Hog Trencher and front end dozer.

New Deere 420 Crawlers, with industrial loaders.

New Jeep-A-Trenchers, New Hopto Backhoes.

For real buys—see

MARTIN IMPLEMENT COMPANY
Roanoke, Illinois

SPECIAL SURPLUS
WIRE ROPE SLINGS
AT REDUCED PRICES
EXCELLENT CONDITION

⅝" x 15' 18" Eye	$ 2.50
⅝" x 50' 18" Eye	5.00
¾" x 10' 18" Eye	2.75
¾" x 12' 18" Eye	3.25
¾" x 15' 18" Eye	3.75
¾" x 55' 18" Eye	10.00
¾" x 60' 7" Eye	11.00
⅞" x 12' 18" Eye	4.00
⅞" x 50' 24" Eye	11.00
1" x 20' 24" Eye	6.50
1" x 45' 24" Eye	10.50
1" x 55' 24" Eye	11.50
1" x 60' 24" Eye	12.00
1⅛" x 50' 24" Eye	12.00
1¼" x 80' 24" Eye	20.00
1⅛" x 30' 24" Eye	10.00
1½" x 50' 24" Eye	12.50
2" x 40' 24" Eye	15.00

North-West Wire Rope Co.
966 - 77th Ave. - Oakland, Calif.
Phone: LO 2-2953

FOR SALE

1—Ingersoll-Rand 505 4" drifter	$ 780.00
1—Gardner-Denver DH 123 - 4½" drifter	1,900.00
1—Used Model 30 MARKROY Drill Crane, max. drilling height 30', self propelled	11,000.00
22 pieces new ⅞" hexagon drill steel, 20' lengths - Price for lot	100.00

THE MARKROY COMPANY
6th & McCambridge - Tel.: GLenview 2-7188
MADISON, ILLINOIS

For Sale

One 1947 three yard Rex Hi-Discharge Moto Mixer mounted on a 1950 GMC Model 622 chassis; 900 x 20 10 ply tires; standard cab; 5 speed transmission, price, $1,000. Also, one 1947 Smith 3 yard Mixer, unmounted, will mount on your truck; Model 455; closed seal end; new drum in 1951, price $500. Frederick G. Smith Div., Freeport, Illinois.

BUCYRUS-ERIE 7-W DRAGLINE, 140' boom, 8 yd.
B.-E. 120-B electric shovel, 5 yd.
88-B shovel and 88-B shovel-dragline, 4 yd.
P&H 855 and 1055 shovels and draglines.
American Revolver R-20. 4' & 7' Symons cones.
8466 JAW CRUSHER. 4022 Pioneer triple roll.
5360 C. R. impactor. 4100 ft. 42" conveyor.
CRUSHING PLANT in the Southeast. 42x48 r.b. jaw. 4¼' Symons. 3' Traylor. Compressors. Shovels. Conveyors. Screens. Feeders. Trucks.
All types of crushing & washing equipment. Bins - Bucket Elevators - Classifiers - Compressors - Conveyors - Cranes - Derricks - Drills - Dump Cars - Engines - Feeders - Generators - Hoists - Kilns & Dryers - Locomotives - Motors - Pumps - Screens - Shovels & Draglines - Transformers - Trucks - Weightometers.

STANLEY B. TROYER EQUIPMENT CO.
Box 97 Phone 500 Crosby, Minnesota

30
WHITE TANDEM
DUMP TRUCKS

1949 - 50 - 51 - 52 - 53
8 to 10 yd. Dump Bodies
& Twin Hoists

1555 Timken Tandem Axles
& 150A - 250A Motors
Auxiliary Transmissions

Some have 900 x 20 Tires, and others have 1000 x 20 Tires

These were traded in on new Macks and will be sold at Below Market Value.

Mack Trucks, Inc.
3300 So. Wentworth Ave.
Chicago, Ill. Ph. CA 5-5405

FOR SALE

Barber-Greene Finisher Model 879-A Serial 45-56 Less than one year old Has run only 39,-000 tons on Oklahoma Turn-pike—perfect condition with new augers—only $12,000.00.

HUNTER-QUAPAW ASSOCIATED,
BOX 348
Miami, Oklahoma
Phone K12-2872

FOR SALE
DIESEL LOCOMOTIVES

2—10 ton Plymouth, Model DHD; 40½" gauge, Four Wheels, Serial #5207 and #5208. New 1946.

1—10 ton Plymouth, Model DHDX; 40½" gauge, Four Wheels, Serial #5412. New 1949.

These units are fully equipped and can be adjusted so they can operate on 36" and 42" gauge by shifting the wheels on the axle in or out. Additional information on request.

Philadelphia Transformer Co.
Box 566 Dalton, Pa.

FOR RENT OR SALE

3—Model B Tournapulls

3—Gar Wood 625 Scrapers, 25-yard capacity

4—Caterpillar D-8 Tractors with Allis-Chalmers 315 Scrapers

Tractors are late serial numbers and in excellent condition.

Scrapers are like new.

FEHRS TRACTOR & EQUIPMENT CO.
1809-11 Cuming Street, Omaha 2, Nebraska

KOEHRING PAVER

34-E Double Drum
A-1 Condition

Current Model
$20,000.00 F.O.B.

SHERWOOD EQUIPMENT CO., Independence, Kans.

FOR SALE

MANITOWOC Dragline, 120' boom, 5 yd. bucket. Price on cars $84,000.00.
BUCYRUS-ERIE Dragline, 140' boom, 8 yd.
NORTHWEST model 80D Shovel, 2½ yd. new in 1953. Price $26,300.00 on cars
NORTHWEST model 80D Shovel & Drag new in 1951, Price $30,500.00 on cars
BUCYRUS-ERIE Shovel 54B 2½ yd., 2½ yrs. old

WILLIAM LUBRECHT, III
311 W. Diamond Ave., Hazleton, Pa.
Phone: Gladstone 5-4041 or 5-0253

FOR SALE OR RENT

Lima Diesel Crane. Model 602. 1½ yd. bucket and 30 ton crane capacity. 120 ft. boom, plus jib. Independent boom hoist. General Motors 174 HP diesel engine. Crawlers 16'10" long.

Price $20,000 f.o.b. car.

WHISLER EQUIPMENT CO.
1906 Railway Exchange Bldg.
St. Louis 1, Missouri

USED BARBER-GREENE ASPHALT PLANT

Consisting of Model 840 Mixing Unit with LeRoi D-201 gasoline power, 834 Fines Feeder, truck loading belt conveyor, Barber-Greene drier, Clarage exhaust fan, double cone dust collector, Buda gasoline power for drier, cold elevator, hot elevator, gradation control unit. Approximate cap. 35 T.P.H. Plant 10 years old, working good last fall. Price complete unit, F.O.B. Kansas City $12,500.00

The G. W. Van Keppel Co.
2461 Pennway - GRand 1-1540
KANSAS CITY 8, MISSOURI

MUST BE SOLD TO SETTLE ESTATE

MACHINES READY TO GO

CAT. D-8 B-DOZER	$7,500.00
CAT. D-7 B-DOZER	6,000.00
CAT. D-8 A-DOZER	5,000.00
CAT. No. 112 GRADER	4,500.00
LIMA ¾-YD. SHOVEL CAT. DIESEL ENGINE	5,000.00
2—LETOURNEAU 12 YD. SCRAPERS	2,000.00 ea.
FIVE TOURNAPULLS	$4,500.00 TO $6,500.00 ea.

KARL R. MARTIN
P. O. Box 1787 Phone 7-6450
KNOXVILLE, TENN.

JOHN P. TOLP & SON'S

Hydro Crane Rentals
24 Hour Service

5138 W. Hirsch Street
Chicago 51, Illinois
Phone: TUxedo 9-0918

FOR SALE

PILE DRIVER 42B Bucyrus-Erie For Sale, 100 ft. leads, #1 vulcan hammer, standard base.

TRIANGLE CONTRACTORS, INC.
12 Karnell St., Spring Valley, N. Y.

THE ROLLPAC

$895.00

A Standout One Ton Roller in worldwide use by Contractors, Paving Engineers and Institutions.

Ask To See It.

ROLCOR Industries
1208 2nd Ave. So. Minneapolis 3, Minn.
. . . for more details circle 320, page 16

Get Full Facts on the original

ROGERS
DOZER RIPPERS
QUICK ON . . . .
. . . . QUICK OFF

RIPS ROCK
CONCRETE
HARD PAN

Eliminates many types of drilling and shooting

May be used singly or in multiples

Write for name of nearest dealer

E. A. ROGERS COMPANY
P.O. Box 1016, Grass Valley, Calif.

. . . for more details circle 354, page 16

PRESTRESSED BEAM

(Continued from page 132)

fiber of the 36 in. deep beam, hence the stress there is $\frac{25.16}{36} \times 2012 = 1405$ psi. Therefore, $f_t' = 1905 - 1405 = 500$ psi.

Substituting in the formula, we get

$$s_t = \frac{500}{2} - \sqrt{(589)^2 + \left(\frac{500}{2}\right)^2}$$

$$= 250 - \sqrt{346{,}921 + 62{,}500}$$

$$= 250 - 640 = -390 \text{ psi.}$$

Allowable $s_t = 0.08 \times 5{,}000 = -400$, therefore, no stirrups are required for diagonal tension.

Next, we should check shear to see if stirrups are required under design load. From previous calculations we know $V_D = 20.2K$, $V_L = 30.6K$ and $V = 50.8K = 50{,}800$ lb.

$$V = \frac{50{,}800}{130{,}400 \times 6} \times 4{,}112.27 = 267$$

$$s_t = \frac{500}{2} - \sqrt{(267)^2 + \left(\frac{500}{2}\right)^2}$$

$$= 250 - \sqrt{71{,}289 + 62{,}500}$$

$$= 250 - 366 = -116 \text{ psi.}$$

The allowable according to BPR Criteria is $0.03f_c = 0.03 \times 5{,}000 = 150$ psi. Hence, stirrups are not required on any design basis. As stated before, however, designers all use stirrups and the BPR Criteria recommends a minimum—see page 2 of Criteria.

CONCRETE BY NIGHT

(Continued from page 56)

tions called for 1 gal. per 200 sq. ft. The inspectors found it easy to calibrate or check by simply measuring the forward travel of the sealing machine while it filled a gallon bucket.

Dummy groove construction joints, 2¾-in. deep with ⅜-in. top and ¼-in. bottom width, were cut by steel templates on 25-ft. centers. As each joint was formed and edged a piece of ¾-in. rope was placed over it to protect it and keep out the dirt. Servicide jet-resistant joint seal also was used.

Concrete was batched at a plant installed by M-K on railroad trackage adjacent to the plant of the aggregate subcontractor, Curtis Construction Co. Another article will describe the ingenious stockpile setup and conveyor installation which allowed the batch plant operator to selectively convey any one of the three gradations to the batch bins.

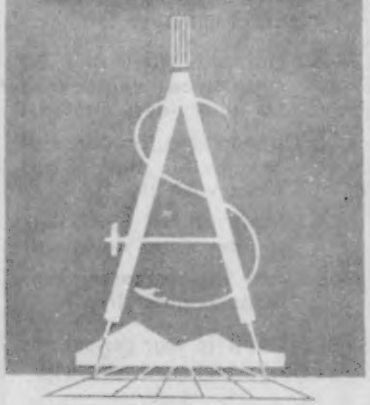
The asphalt plant of D & H Paving Co. was also located near the Curtis crushers and rail line to expedite delivery of aggregate and asphalt. The all-electric plant was a Madsen 4,000-lb. with No. 255 dryer which averaged 180 tons per hour of synchronized mix delivery.

Three gradations of aggregate were stockpiled over a 96-in. corrugated iron pipe with four aggregate openings. Each aggregate opening was equipped with a Syntron vibratory feeder emptying onto a 30-in. conveyor belt. The Syntron feeders were controlled by the plant fireman. A Cat D7 dozer pushed the aggregate over the openings as required. A Hi-Way hot oil heater was tied into three 10,000-gal. asphalt storage tanks.

● *Personnel.* For M-K: Darwin Lind, project manager; Glenn Toy, project engineer; and Ralph Smith, office manager. For Curtis Construction Co.: Rexford Stuart, superintendent, and Bill Sipes, crusher foreman. For D & H Paving Co.: Robert Donkle, superintendent, and Bob Newell, plant foreman. For the Corps of Engineers: Gerald Bletcher, resident engineer.

Hold paper nearly level with eye to read this message
. . . for more details circle 351, page 16

AIR SURVEY CORPORATION



Photogrammetric Engineering

Advances starting time.

Conserves engineering manpower.

Produces fast but factual data.

Is economical but exact.

1101 LEE HIGHWAY, ARLINGTON 9, VIRGINIA
. . . for more details circle 234, page 16

Manufacturers' Literature

Silicones Protect Masonry

The various benefits provided by silicon masonry water repellents and specifications for applying them are described in a new brochure, "Silicone Masonry Water Repellents," offered by the Silicone Products department, General Electric Co., Waterford, N.Y. The booklet is designated CDS-81 and is illustrated by photographs of laboratory tests showing the effectiveness of silicones in minimizing water absorption, efflorescence, spalling and cracking. Also included are photographs of typical structures treated with silicones.

For more information circle 145 on Service Coupon Page 16 and mail now

Rock Salt Caking Prevented

"Sterling Storite," International Salt's new anti-caking agent for the storage of ice removal rock salt, is treated in a short booklet just published by International Salt Co., Scranton, Pa. Description of the product, how it works, how it should be used, how to minimize rain losses and how to order are covered under separate headings.

For more information circle 146 on Service Coupon Page 16 and mail now

Gratings of Various Types

Bulletin No. 2527, Grating department, Blaw-Knox Co., Pittsburgh, Pa., presents 26 pages of illustrated descriptions on electroforged, riveted, rectangular, diagonal, "U" type and "T" interlocked grating and treads. Tables on safe loads and information necessary to specify are also included in the catalogue.

For more information circle 147 on Service Coupon Page 16 and mail now

Complete Line of Power Units

Detroit Diesel Engine division, General Motors Corp., Detroit, Mich., has issued a 19-page illustrated catalog outlining its complete line of power units for all types of industrial applications. Specifications are given on 31 engine models ranging from 44 to 761 brake horsepower including new 6-cyl. turbopower engine.

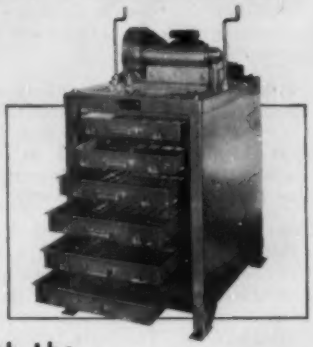
For more information circle 148 on Service Coupon Page 16 and mail now

Pictures Describe Sweeper

An illustrated flyer containing a condensed description of the "Street King" sweeper has been issued by the Elgin Corp., Chicago, Ill. Strength, compact arrangement, special provisions to avoid corrosion, and appearance are all stressed. The unit carries a "payload" of 4 yds. plus.

For more information circle 149 on Service Coupon Page 16 and mail now

CONTROL SIZING FAST, ACCURATELY AT THE JOB SITE



with the

GILSON

TESTING SCREEN

Be sure of accurate size-control of road aggregates — by the method the entire industry respects: GILSON Screen Testing.

Operating at the job site or field lab, the GILSON Screen takes a cubic-foot sample of coarse aggregate, makes two to seven separations simultaneously, in five minutes or less per complete test. The GILSON Mechanical Testing Screen is built for rough use, requires practically no maintenance, is moderate in cost.

A sand attachment is available for handling 8-inch sieves.

THE GILSON TESTING SCREEN IS THE STANDARD SIZING CONTROL OF THE INDUSTRY.

Write for full information, or call Malinta 592.

GILSON SCREEN CO.
MALINTA, OHIO

. . . for more details circle 275, page 16

With the Manufacturers and Distributors

A. E. (OLLIE) KRAMER of Springfield, Ill., is now associated with Shovel Supply Co. of Dallas, Texas, as district representative in the central-midwest states, including North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa, Illinois, Missouri, Wisconsin, Michigan, Ohio, Indiana and Kentucky. For the present, Kramer's headquarters will be at 4113 Peoria Road, Springfield, Ill.

JOY MANUFACTURING CO. announces the appointment of the Duckworth Supply Co., Inc., as a new distributor in the Port Arthur–Orange area in Texas. Duckworth will handle the entire Joy line of construction equipment.

FOUR WHEEL DRIVE AUTO CO. of Clintonville, Wisc., pioneer manufacturer of 4 and 6-wheel drive trucks, announces the opening of its new branch sales and service center at Duncan, Okla. The new facilities are located on the west side of Highway 81 just south of Duncan.

M. B. GARBER, vice president and director of sales for Thew Shovel Co., Lorain, Ohio, has announced that George E. Gunther, formerly assistant sales manager, has been appointed sales manager of shovel and crane product. Gunther assumes full responsibility for the supervision of Thew's district sales managers and the direction of sales activities with domestic distributors.

ALVIN J. MISTLER and Delbert J. Stoker have been elected vice presidents of Armco Drainage and Metal Products, Inc. Mistler will continue as manager of the midwestern division of the company with headquarters at Topeka, Kans., and Stoker will retain his position as manager of Armco Drainage's North Pacific division with offices in Portland, Ore.

W. K. SMITH has been appointed district manager in St. Louis, Mo., for American Bitumuls & Asphalt Co., succeeding J. S. Felter, who resigned. Replacing Smith in Mobile will be R. P. King, formerly supervisor, Laykold sales, eastern division office, Baltimore, Md. King will be replaced in the eastern division office by R. L. Hoover, formerly sales engineer in the St. Louis district.

HUBER-WARCO CO. of Marion, Ohio, announces the appointment of Archer Tractor and Machinery Co. as a distributor of Huber-Warco motor graders, tandem rollers, 3-wheel rollers and maintainers for the entire state of Utah, northeastern Nevada and southwestern Wyoming. Archer's office and shop facilities are located at 1118 S. Main St. in Salt Lake City.

Drill Under Pavements, Railroads
. . . with McCarthy UNDERGROUND Auger Drill
SPEED PIPE LINE WORK
CUT COSTS
50%
Speed pipe laying work and eliminate resurfacing costs by drilling under pavement, RR beds, foundations and through tree roots with McCarthy Model 1020-24 Heavy-Duty Trench Type Auger Drill. Auger rotates inside pipe, advancing it into the hole as it is bored. Couple 6-ft. auger and pipe sections as each length is drilled. Bore up to 24 in. diam. holes through earth, clay, compacted sand and gravel, hardpan, shale and soft sandstone formations. Drill eliminates closing busy highways and meets federal, state and local regulations. Youngstown, O. contractor completes in 2 or 3 days jobs formerly requiring 2-3 weeks. Other McCarthy Trench Type Auger Drills bore holes from 4 in. to 36 in. in diam. Contact us direct and distributor will call promptly.
HEAVY
RUGGED
POWERFUL
SALEM
THE SALEM TOOL CO.
808 S. ELLSWORTH AVE. • SALEM, OHIO

. . . for more details circle 321, page 16

Put
POWER
In Your Engines!
with
L-X
L-X 8 L-X 8 L-X 8 L-X
L-X
A MODERN CHEMICAL SUPPLEMENT FOR ALL FUELS AND OILS USED IN INTERNAL COMBUSTION ENGINES
LUBRICATION ENGINEERS, INC.
Fuel and Oil
Chemical Supplement For All
Internal Combustion Engines
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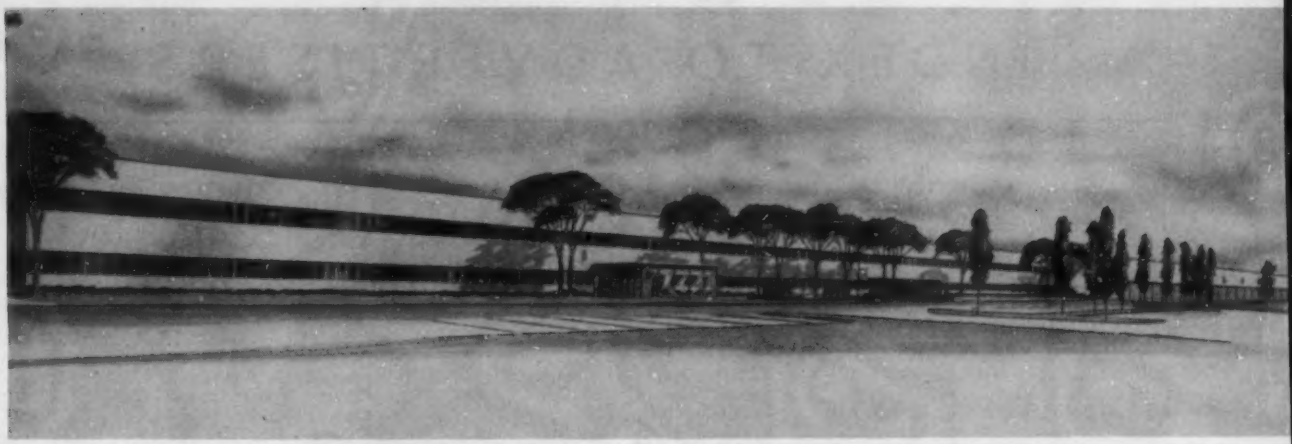

● Modernistic in appearance—new Euclid plant in Ohio to turn out TC-12 tractors for every construction.

Euclid Builds New Crawler Tractor Plant in Ohio

Ground-breaking ceremonies in Hudson, Ohio, recently marked the beginning of a new 650,000-sq. ft. manufacturing plant for Euclid Division of General Motors Corp. Especially designed for the manufacture of crawler tractors for heavy construction and industrial use, the plant is expected to be in operation by July, 1958.

Ohio Governor C. William O'Neill, Raymond Q. Armington, general manager of Euclid Division, Cyrus B. Osborn, GM vice president in charge of engine divisions, and other local leaders from government, business and industry in the Akron-Cleveland area participated in the ceremonies.

Three models of the Euclid earthmovers—the TC-12 tractor, a 218 hp C-6 crawler, both of which will be built in the plant, and the new Twin-Power TS-24 scraper with a heaped capacity of 32 cubic yards or 40 tons—were used in the actual ground-breaking for the 500,000 cubic yard excavation and filling job.

This crawler tractor manufacturing plant represents the first phase of expansion plans which tentatively call for additional manufacturing facilities, a complete parts warehousing operation, and general offices on the 430-acre site on Route 91 south of Hudson. The new plant is expected to have 1,800 employees by 1960.

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Report from Texas contractor on the NEW CAT* No. 955 TRAXCAVATOR

"We really like it. It does a heap of work well on many different types of jobs."

Jack Crea, Crea Bros., San Antonio, Texas

Twenty miles west of Austin, Crea Bros. are rebuilding 7 miles of farm-to-market road. Among the firm's Caterpillar equipment, there's this new 70 HP No. 955 Traxcavator* with 1½-yard bucket. Handling rock, gravel and cement, it's tearing out an old culvert for replacement to widen the road. Because of its versatility, it's kept busy 10 hours a day, 6 days a week, on many different types of jobs from excavating to loading.

The new No. 955 is proving a highly productive machine on operations all over the country. Here are some reasons why:

1. 40° bucket tilt-back at ground level assures large loads every pass.

2. Perfect balance of weight, power and capacity keeps the full length of the track on the ground even with a heaped load.

3. New oil-type clutch cuts costs two ways. Clutch adjustment, while easy, is seldom required. Plate replacement is often unnecessary even at engine overhaul.

4. Modern hydraulic system insures delivery of full volume and pressure of oil for thousands of hours. Filter located for easy replacement of element.

5. Pilot-house visibility provides excellent view of all bucket positions. All controls in easy reach—bucket control a one-hand operation.

6. Plenty of power to "bury" the bucket also provides fast lifting and positive dumping under all load conditions.

7. In-the-seat starting with choice of 6-volt electric starting for starting engine or 24-volt direct electric starting.

Your Caterpillar Dealer is a source of fast, dependable service and reliable information. See him for complete facts about the new No. 955!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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For Louisville's expressway traffic..

..this 8¾-inch hot mix Texaco Asphalt pavement

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The Henry Watterson Expressway diverts heavy through traffic around the heart of Louisville, Ky. It is significant that in designing the pavement for this important artery, wholly flexible construction was chosen, from the subgrade up.

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Such a pavement combines exceptional durability with low upkeep cost. The reason is that its flexibility enables it to maintain complete and lasting contact with the subgrade, thus assuring it of the full support of the underlying soil at all times.

Whether your city plans to build an expressway or to surface a secondary street, there is a type of heavy-duty, intermediate or low-cost Texaco Asphalt construction exactly suited to your requirements. Helpful information on all of these types is supplied in two free booklets, which our nearest office will be glad to send you.

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